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Spraying Experiments to Destroy Prickly Pear.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist, and HUGH ROSS,
Chief Inspector of Agriculture.

THE question as to what are the best methods of destroying prickly pear is of the greatest importance to the landowners of this State and the community generally. Numerous specifics for spraying (some of them reputed to kill the pear at a nominal cost) have been tried for several years, but it can safely be said that no specific has yet come under the notice of the Department that will kill pear cheaply by means of one application.

The experiments conducted by the Department were commenced not with any expectation of discovering a royal road to the extermination of the pest, but with a view to testing the efficiency and cheapness of various methods. For this purpose, an area at Scone was selected as being the most heavily infested pear area and the most difficult to deal with that could be found. The pear had been well established for over thirty years; many of the plants were tough and "staggy," and the number of small plants and seedlings was very great.

Of all the poisons that have been tried for killing prickly pear, the most efficacious has been found to be some form of arsenic. It has been tried in Queensland in the form of a gas (gaseous arsenic trichloride), but in the open a gas is too unmanageable to achieve definite and uniform results. Arsenic acid has been stated to be the best substance for the destruction of prickly pear, but its price is prohibitive, and in Australia it is practically unprocurable.

Need for Concentrated Solutions.

It was therefore decided to institute a comparison between liquid arsenic trichloride and some form of arsenious acid, commonly known as white arsenic, or still more simply as arsenic. It may be pointed out that arsenic itself resembles a metal in some of its properties, and that the poisonous substance commonly known as arsenic," or white arsenic, is an oxide of this element. Solutions of this white arsenic have frequently been tried for poisoning prickly pear, but usually the strength of the solution has not been greater than 2 or 3 per cent., and the quantity sprayed on an acre has been up to 200 gallons or over. In the experiments carried out at Dulacca by the Queensland Government, for example, the minimum amount of spray used per acre was 320 gallons.* When it is considered that prickly pear usually grows in districts not too well supplied with water, and that prickly-pear areas frequently occur at distances of some miles from the nearest water, the necessity for reducing, if possible, the amount of spray used becomes obvious, inasmuch as the cost of water carriage may become prohibitive.

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* Dr. Jean White-Haney. Reprint of Appendix IV, Annual Report of Department of Public Lands, Queensland, for the year 1915, p. 12.

Arsenic Trichloride.

Arsenic trichloride is a heavy fuming liquid, which contains a high percentage of arsenic. As soon as the liquid comes in contact with water it is decomposed into white arsenic and hydrochloric acid. When it is sprayed upon prickly pear this decomposition takes place to a very great extent; the pear becomes coated, where sprayed, with a thin film of oxide of arsenic, and the hydrochloric acid goes off for the most part as vapour. The oxide of arsenic on the pear may sometimes be peeled off the plant in thin scales, and, if these are examined under the microscope, they give an exact replica of the portion of the leaf from which they have been taken, even to the structure of the stomata or leaf-pores. The hydrochloric acid gas given off by the decomposition of the arsenic trichloride is a curse rather than a blessing. It irritates the pear with which it comes in contact, causing it to form cork externally. This cork protects the pear to a large extent when it is subsequently sprayed. The hydrochloric acid gas carried by a gentle breeze may thus effect a most extensive area of pear, causing it to turn brown and to become corky on the outside, but beyond this nothing further takes place. On pear that has not been subjected to any treatment, little round patches of cork may sometimes be found; but on pear that has been irritated externally by a gas, or on pear shoots that grow out from previously poisoned pear plants, the corky spots are very numerous and may become confluent. The pear produces these spots of corky tissue externally very easily; their exact function is not clear, but they are not signs of disease or decay. Arsenic trichloride is expensive, costing approximately 16s. per gallon, and has to be applied by means of a special steel atomiser. Our experience with this atomiser is not satisfactory, as it requires to be pumped up at very frequent intervals to maintain the necessary pressure. This pressure is a diminishing quantity from the very moment the atomiser is in use. In addition, the nozzle is liable to become stopped up through corrosion brought about by the arsenic trichloride.

Where we have sprayed arsenic trichloride in very large quantities upon isolated clumps of prickly pear that was green, with little "stag" (*i.e.*, with no great amount of old, tough, cork-covered stems), the plants have died completely, including the bulbs; but where we have sprayed old staggy pear with arsenic trichloride in amounts that could in any way be considered as applicable on a commercial scale, the plants have not died. The young leaves have dried and some of the older stems have rotted, but sooner or later from the old stems or from the bulbs fresh shoots have made their appearance, and the plants exhibit every sign of re-establishing themselves.

An Improved Pump.

The atomiser having proved, in our opinion, a failure, and arsenic trichloride too expensive, a search was made for a better form of pump, and it was finally decided to purchase a "Bean" pump. This was larger than was actually required, but it was the only one of the type to be had in Sydney at the time. The special features of this pump are (1) it has a very large air-bell that enables a *constant* pressure up to 200 lb. to be maintained; (2) it has a powerful compensating spring that aids in pumping on the forcing stroke; (3) the pump lever is long and the stroke is backwards and forwards and not up and down, and the pumping operation does not require much labour. A nozzle, the hole in the centre of which is countersunk, is supplied with the pump, and gives a cone of fine spray, the centre of which is not hollow.

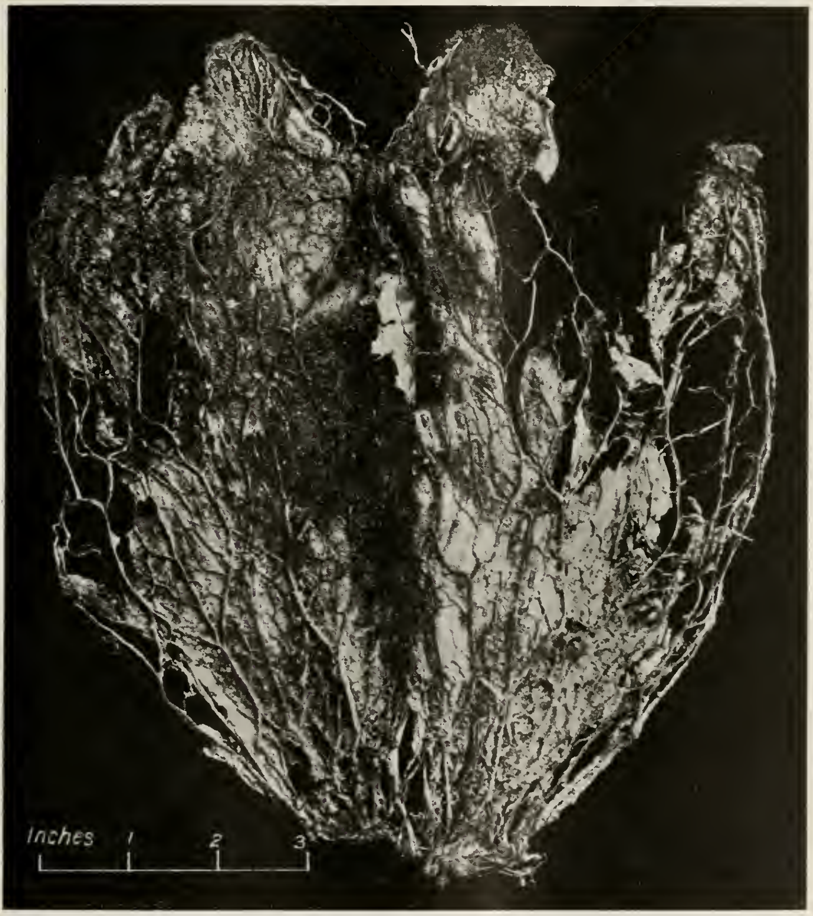

Fig. 1.—Young segment of prickly pear after poisoning. To show the fibrous structure it has been opened out to expose the interior.

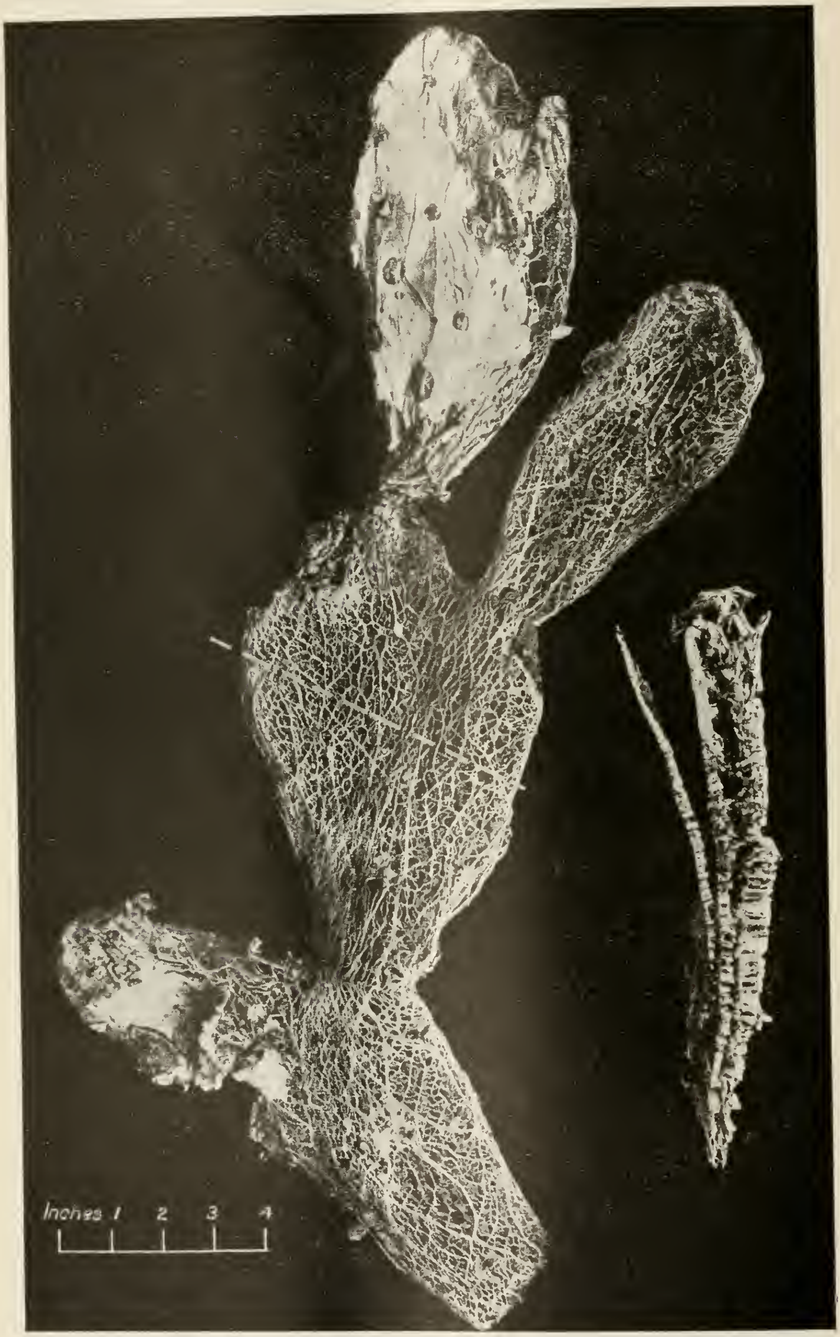

Fig. 2.—Segments of prickly pear, from which the pulp has rotted, some months after spraying with poison. The dense structure of fibre alone remains. The smaller illustration shows a cross section of the middle segment cut where marked with a line.

SPRAYING EXPERIMENTS TO DESTROY PRICKLY PEAR.

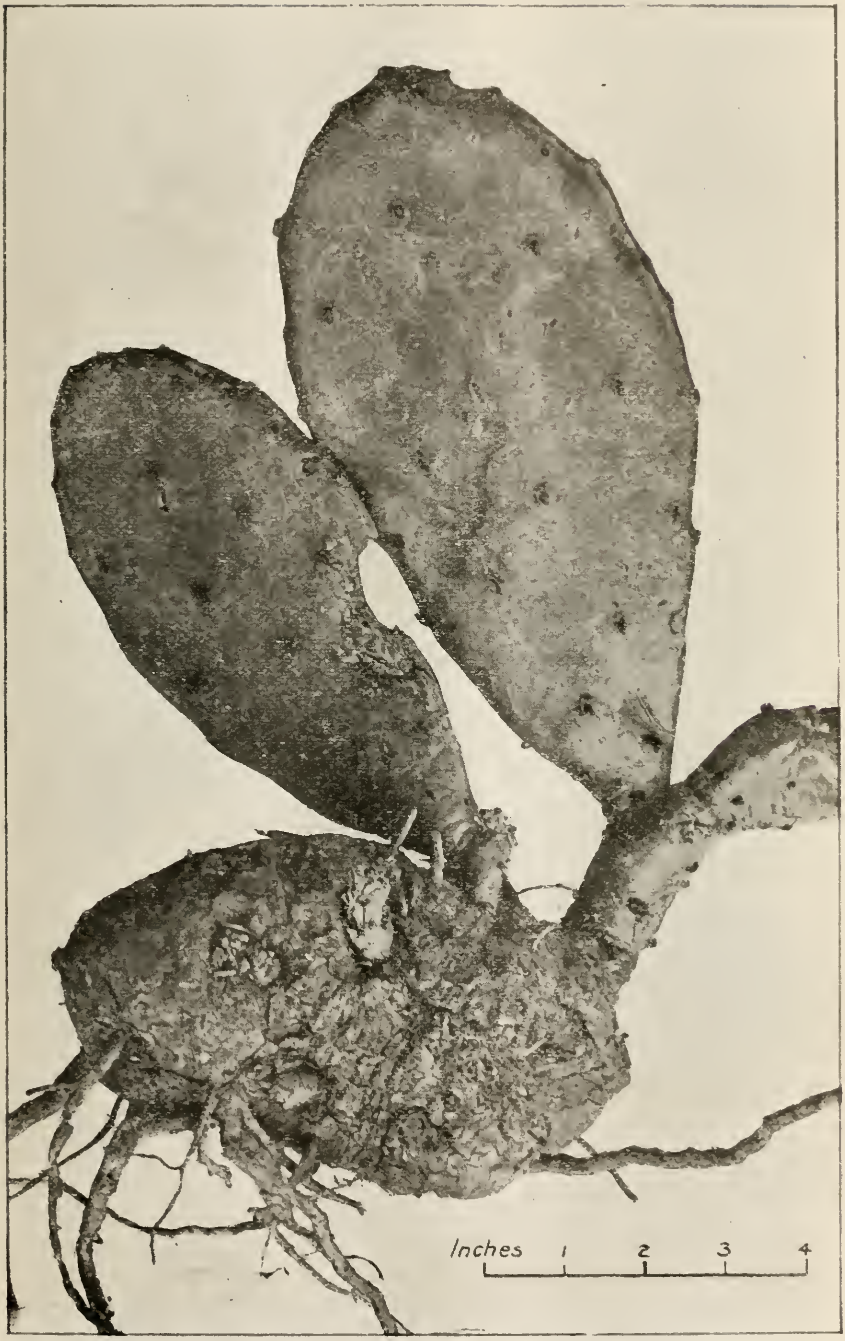

Fig. 3.—Small pear plant, showing leaf segments, bulb, and roots.

Spraying Experiments to Destroy Prickly Pear.

This is a desideratum, as the object in spraying pear should be to distribute a fine spray on as many segments of the plant as possible without waste. This question of waste is of especial importance when applying concentrated sprays. With the object of preventing waste an "Edgell" release valve was fitted to the base of the metal spray tube, about 5 feet below the nozzle. This valve is actuated by a small lever which enables the operator, no matter what the pressure of the pump may be, to commence spraying and to cease spraying instantly at will. By a slight modification of this valve we were able to reduce the size of the cone of spray, and finally to obtain the most complete control in the application of spray that could be desired. The pump was mounted in a cart drawn by one horse, and the area of pear that could be sprayed in a given time, with one man to operate the pump and guide the horse and another to apply the spray, was very large and quite satisfactory.

Specifics Used.

The use of prepared commercial arsenate of soda was not contemplated since the substance on the market is of variable composition. It was decided instead to prepare strong solutions of arsenious oxide in caustic soda. The maximum amount of arsenious oxide that can be conveniently dissolved in a gallon of water, to which 1 lb. of sodium hydrate has been added, is 4 lb. It was thought that caustic soda might have some irritating effect upon the cuticle of the pear, and that in consequence the arsenious oxide might penetrate the pear more quickly if the amount of sodium hydrate was increased. The following solutions were therefore made up, and applied at the rates indicated :—

	Arsenious Oxide.	Sodium Hydrate.	Water.	Cost of materials per Gallon.	Amount applied per acre.
	lb.	lb.	lb.	s. d.	gals.
1 ...	40	10	100	2 6	6½
2 ...	20	5	100	1 3	5
3 ...	20	30	100	2 6	8
4 ...	20	10	100	1 6	12

The strongest of these solutions thus costs 2s. 6d. per gallon, as against 16s. for arsenic trichloride. These sprays were applied in September; there can be no doubt that the time to get the maximum rotting effect from a spray would be in the autumn, when the plant is about to enter upon its winter rest, but time was of importance. After two months the net result of the application of these strong sprays was very much the same, viz., (1) all the young pear segments dried out and died; (2) the older segments and some of the stems were rotting, but there appeared to be no likelihood of the rot extending to the bulb.

This appears to have been the experience in Queensland, where a vast number of different sprays were tried. "In almost every instance of spraying, however complete the work accomplished may appear to be, after a varying interval of time has elapsed since the application of the poison green shoots make their appearance, issuing from some few nodes which have not received sufficient poison to permanently destroy their vitality. No poisonous specific has been used here which can yet be depended upon to completely exterminate the plants with certainty every time it is used, though in isolated cases this result is often achieved."*

The young segments affected by the poison become dry and quite brittle; usually they become detached from the parent plant, but are quite incapable of rooting.

At Fig. 1 a young segment, after poisoning, is seen. It has been split in two and opened out, exposing the interior. A layer of diffuse fibres is seen on each surface; there is very little pulp substance, and it has practically all dried up, only the outer cuticle is left covering the fibres.

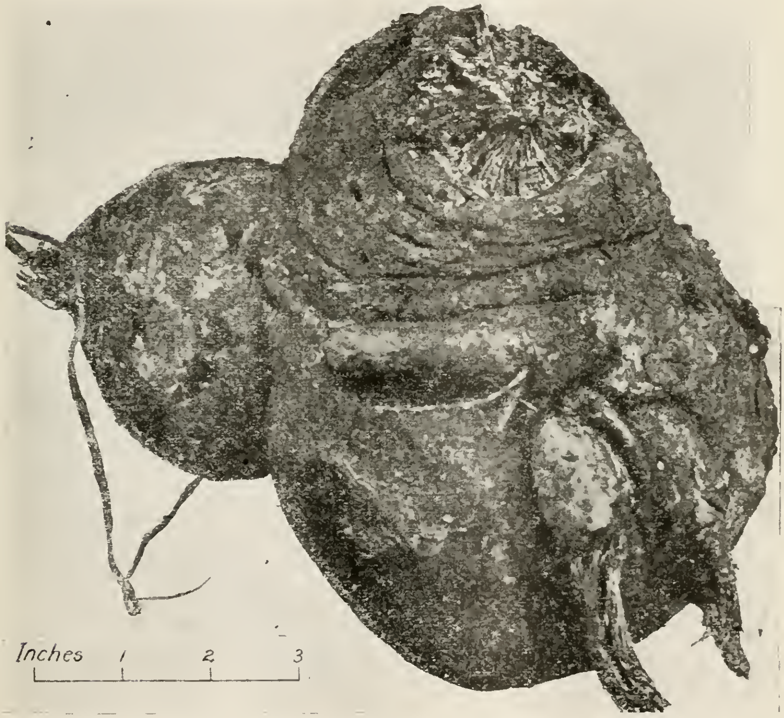

Fig. 4.—Bulb of an old pear plant showing the point where the main stem has been broken off above, and the remains of roots below.

Fig. 2 illustrates several old segments that have rotted after a poisonous spray has been applied; at the upper extremity a young segment is seen that is about to become detached. These old segments show a large amount of thick fibre; the segment in the smaller figure shows four layers of such fibre; the difficulty of *completely* killing such pear by one application of spray can be realized.

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* Dr. Jean White-Haney. Reprint of Appendix IV of Annual Report of Department of Public Lands, Queensland, for the year 1915, p. 11.

Destroying the "Bulb."

The main difficulty, however, in regard to the killing of pear by means of sprays is the destruction of the "bulb." Botanically speaking, this structure is not a true bulb, but as it generally known as such, it will be so called in this article. The bulb is a large swelling at the base of the stem, filled with reserve food material. It contains a large amount of starch; when boiled it tastes somewhat like the ordinary potato, but there is a large amount of viscid material together with the starch. The bulb may be formed quite at the surface of the ground, or it may be several inches below it. From the base of the bulb the true roots emerge and run for great lengths a short distance below the surface of the ground.

At Fig. 3 a small pear plant is shown with its bulb.

At Fig. 4 the bulb of an older pear plant is shown; the point where the main stem has been broken off is seen on the top.

At Fig. 5 a somewhat unusual form of bulb is seen upon a root.

The actual size of these bulbs can be gauged by comparison with the scale printed beside them, one division of this scale equalling 1 inch.

The bulb is a reserve of food material, and is even more tenacious of life than the pear segments; it is formed below the surface of the soil. Any operation or machine that has for its object the complete destruction of prickly pear must deal *with the destruction of the bulb*; unless this is completely destroyed the pear survives.

The outer part of an old bulb consists of dense scales of cork (see Fig. 5). So dense and hard are these that the possibility of destroying old bulbs by spraying without other treatment after they are dug up seems remote, and while they are in the ground it is out of the question.

If the parts of the pear above ground are sprayed with strong poison some of the poison may travel down to the bulb through the stem junction (see Fig. 4) and produce death, but it is the exception rather than the rule for pear to be destroyed in this way.

In places where there has been a good supply of fallen timber and dead leaves we have dug up the bulbs and collected them in heaps together with a fair quantity of timber and litter. On setting fire to these heaps the previously sprayed and dried dead pear segments have burnt out completely, but only here and there the bulbs have been killed outright, while those in the ground below the burning heap have been quite uninjured. When a pear segment is cut across, or when a bulb is cut open, a slimy mucilage exudes; this gradually increases in amount. After a short time it hardens somewhat, forming a felt-like mass; finally it becomes quite hard and impervious to water; drying out is thus prevented and the vitality of the part maintained. In the case of pear segments the cut surface often turns almost black. The formation of this protective coat so soon after injury must be taken into consideration in pear destruction.

From what has been said above it is evident that complete pear destruction cannot be brought about by one spraying, it must be followed sooner or later by slashing to lay open the thick tough stem and the bulb. These must then be sprayed *as soon as possible after slashing* (before the formation of the protective covering) by a second spraying to enable the poison to penetrate to all parts of the plant.

Propagation of Prickly Pear.

Pear is largely propagated by segments which become detached. Any single one of these after lying on the ground a short time curls up at the extremities and usually takes root. It may thicken and form a potential bulb, as may be seen in Fig. 6. Of the large number of seeds produced by prickly pear, comparatively few germinate. They are distributed by birds; and young pears may frequently be seen at the foot of trees and posts that have sprung up from seeds distributed in the droppings of birds. At Scone the black magpie in particular has been observed feeding upon the ripe fruits. Rabbits also eat the ripe fruits, and while most of the seeds are masticated, some pass uninjured through the intestines. Cattle will eat the ripe fruits, and may distribute the seeds in large numbers. There can be no doubt that birds aid largely in the distribution of seed. Trees may be seen here and there all the way from Newcastle to Scone with pear plants springing up at their base. The time to destroy these pear plants is now; it is the utmost folly to wait till the pear plants increase in number and become a pest; the time to eradicate any noxious weed is before, not after, it has become a pest.

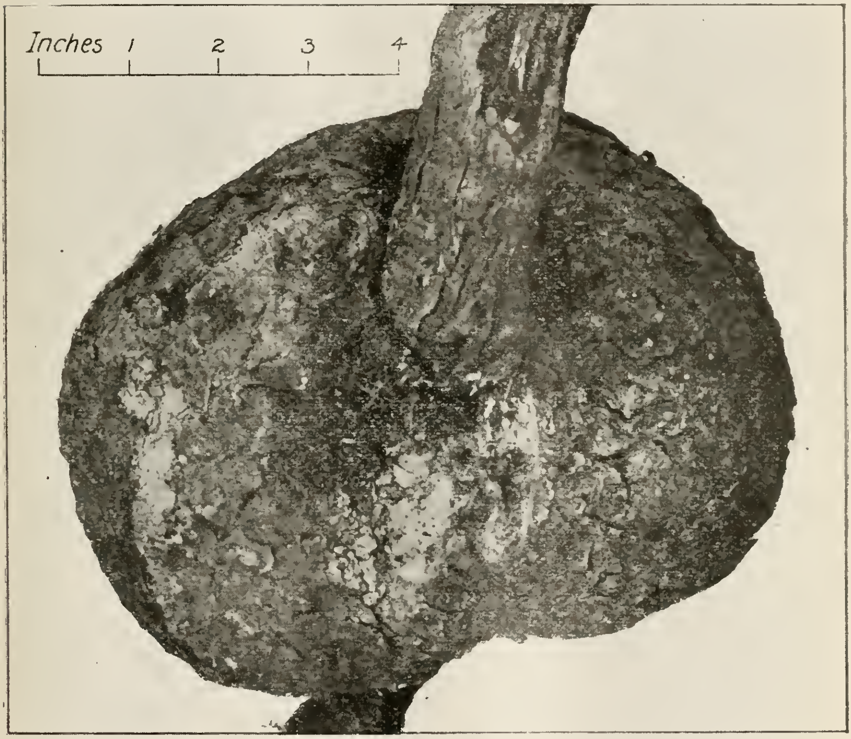


Fig. 5.—A large bulb upon a root. The scaly covering of corky plates is especially noticeable.

Variations in the growth of the Pest Pear.

Not only are there degrees of density of pear infestation, but there are variations in the character of the pest pear (*Opuntia inermis*) according to the conditions of soil and climate under which it is growing. Thus, at Scone it is dense and staggy, with an enormous number of underground bulbs. At Aberdeen, although within a few miles, the pear is nearly all green, with a single bulb at the base that grows near the surface of the ground. At Wee Waa the pear resembles that at Aberdeen, but the individual plants are larger.

The answer, therefore, to the question, what is the best method of clearing pear, will depend largely upon the nature of the pear and the conditions under which it is growing.

Advantages and Disadvantages of various methods of destroying Pear.

1. Pear can be cleared by hand-labour, the bulbs can be dug up and, together with the plants, carted to properly-prepared piles of timber (called "straddles"), and when dry burnt.

   Advantages.—Cattle can be depastured in the paddocks the whole time the work is in progress.

   Disadvantages.—The cost of collecting an enormous weight of green pear. The necessity for picking up every single piece of pear.

2. Pear can be cleared by spraying and then digging out and burning.

   Advantages.—The segments that become detached will die, and will not need picking up.

   Disadvantages.—Since two operations are involved, the cost may be more than that of hand-clearing.

3. Pear can be cleared by spraying, then slashing and re-spraying.

   Advantages.—The poison penetrates to all parts of the plant. No carrying of heavy green pear is involved. The pear can be raked together and burnt.

   Disadvantages.—The method involves three operations. It can only be applied to "clean" pear.

4. Pear can be killed by spraying alone.

   Advantages.—No carting, slashing, or digging out.

   Disadvantages.—The amount of spray that has to be applied to a single plant to exterminate it is so great, that the method becomes too costly except in the case of scattered isolated plants.

5. Pear can be killed by injecting poison into the plant.

   Advantages.—There is no large amount of heavy poisoning material to carry about.

   Disadvantages.—The process of application is tedious, and scattered isolated plants only can be treated.

One disadvantage that applies to all pear treated with poison is that cattle must be fenced off from it for a considerable time, for they sometimes eat poisoned pear and die. The administration of so small an amount as $2\frac{1}{2}$ grains of white arsenic to a man has caused death.

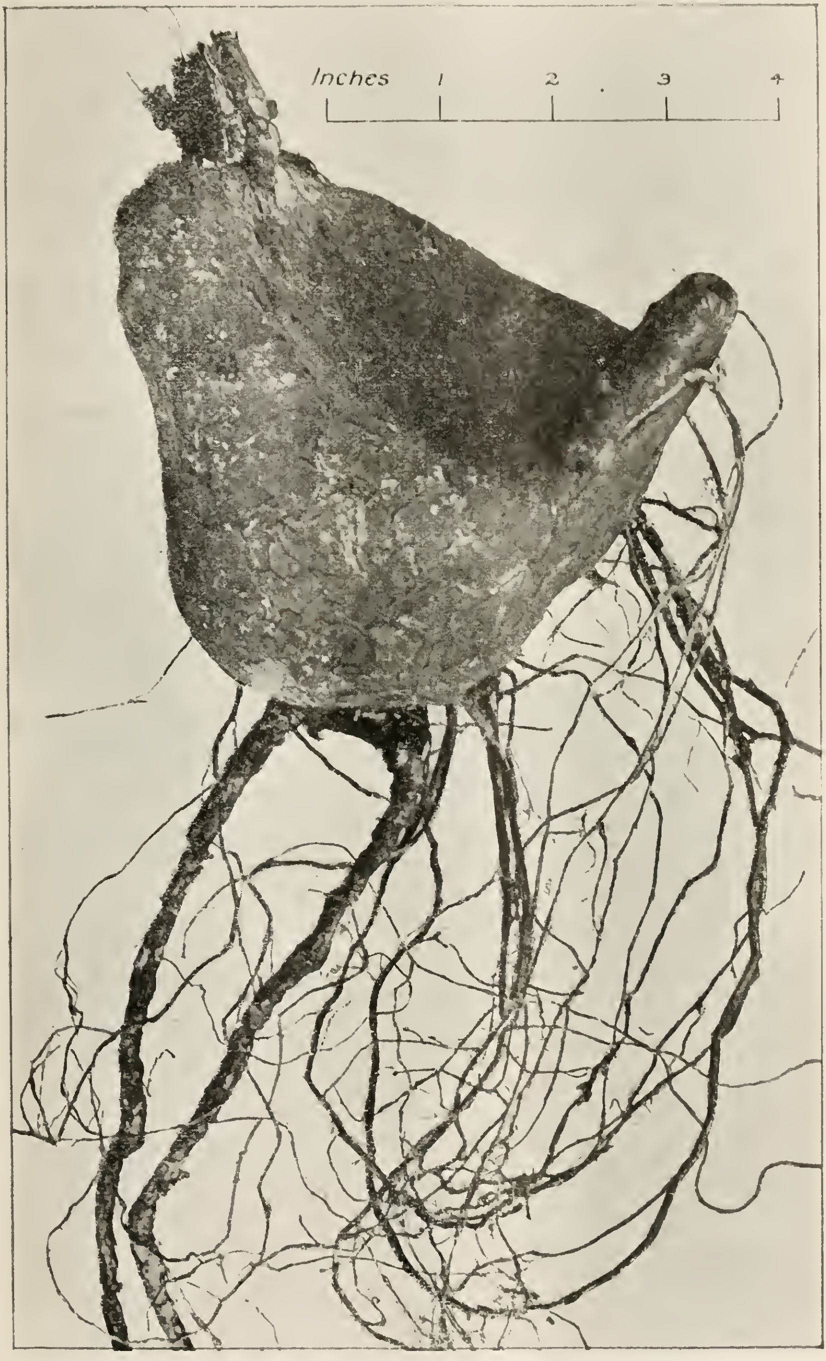


Fig. 6.—Bulb formed at the base of a pear segment that has remained on the ground. The stem scar is seen above, the roots below, and the scaly covering on the side.

SPRAYING EXPERIMENTS TO DESTROY PRICKLY PEAR.

In spraying with arsenic there is great advantage in using a concentrated spray, since water-carriage is saved and the death of the pear accelerated. Hand-labour, however, cannot be avoided; and expensive as this is, there can be no question that it is the duty and interest of every landowner to eradicate the pear from *lightly* infested country. To neglect it is to tolerate an enemy that toils every day and every night, increasing in might month by month. Further experiments will be carried out this year on land infested with clean-growing pear, *i.e.*, pear not having too much staggy growth or too many bulbs. Until the results of these experiments are available, landowners who have thickly-infested country to clear are asked to communicate with the Department before attempting to eradicate this pest with any of the numerous (and in most cases expensive) specifics on the New South Wales market.

CHEESE INTENDED FOR EXPORT.

THE following has been issued by the Under Secretary and Director as a circular to all cheese manufacturers :—

In manufacturing and packing cheese for export it is desirable that manufacturers adopt a uniform system. In order to do this, the procedure is herewith briefly outlined :—

1. For Imperial Contract, cheese should be of 40, 60 or 80 lb. sizes, and care must be taken to get each size uniform in weight—that is, all 40's should weigh, after allowing for shrinkage, 40 lb.; not as now, some 37, 38, or 39 lb. The same applies to other sizes.
2. All cheese should be crated at the factory; this is essential in order that cheese may arrive at the grading depôts in good order and clean in appearance. In grading, points will be deducted for dirty-looking cheese and those that show signs of having been knocked about.
3. Each crate should be numbered at the factory, say, from 1 to 500. Supposing the output to be 20 crates per day, then the first day's crates would be numbered 1 to 20, the next 21 to 40, and so on until 500 was reached; then starting over again from No. 1.
4. The date of manufacture and the vat number should be put on each crate in order to permit the grader to do his work properly. This would enable that official to examine a sample from each vat. Unless this is done, a lot of unnecessary work is entailed in opening additional crates, and, apart from that, if irregular quality is found, the whole consignment may have to be graded down, as it would be impossible to pick out the inferior from the better grade cheese. Therefore it can be seen that it is imperative to pack cheese that is even in quality in each crate. The date and vat marking could be done as follows :—

   $$\frac{1}{26} \qquad \frac{2}{26} \qquad \frac{3}{26}$$

   The top figure indicates the number of the vat, the bottom the day of the month. These marks are additional to the numbering of the crates, as explained in No. 3 above.
5. Cheese should be held in the factory curing-room from twelve to fifteen days before crating, and should be forwarded to the port of shipment at regular intervals—say once or twice a week—where it would be graded and stored at a temperature of from 35 degrees to 40 degrees Fahr.
6. Care should be taken to protect the cheese, while in transit, from the direct rays of the sun.

Details as to strength of crates and general branding of same, also as to scale boards have already been published.

Farmers' Experiment Plots.

MAIZE EXPERIMENTS, 1916-17.

North Coast District.

G. C. SPARKS, Assistant Inspector of Agriculture.

ARRANGEMENTS were made to conduct experiments at eleven different centres on the North Coast last season, the distribution being as even as circumstances would allow, as will be seen from the accompanying map. The name and addresses of the experimenters are as follows :—

F. T. Johnston, Condong, Tweed River.
G. R Savige, Old Bonalbo, via Tabulam.
James O'Keefe, "Rosehill," Wooroowoolgan, Casino.
G. A. Forrest, Coraki, Richmond River.
C. Oliver, Yorklea.
H. B. McLeod, Woodford Leigh, Clarence River.
John Wilson, Coramba.
John Cochrane, "Strathclyde," Karangi.
Henry Short, Dorrigo.
John McLeod, Way Way, Macksville, Nambucca River.
R. Laney, "Yarroval," Sherwood, Macleay River.

Operations at Condong, Old Bonalbo, Casino, and Coraki were unsuccessful, mainly due to seasonal difficulties, and returns are only available from seven centres.

The Various Plots.

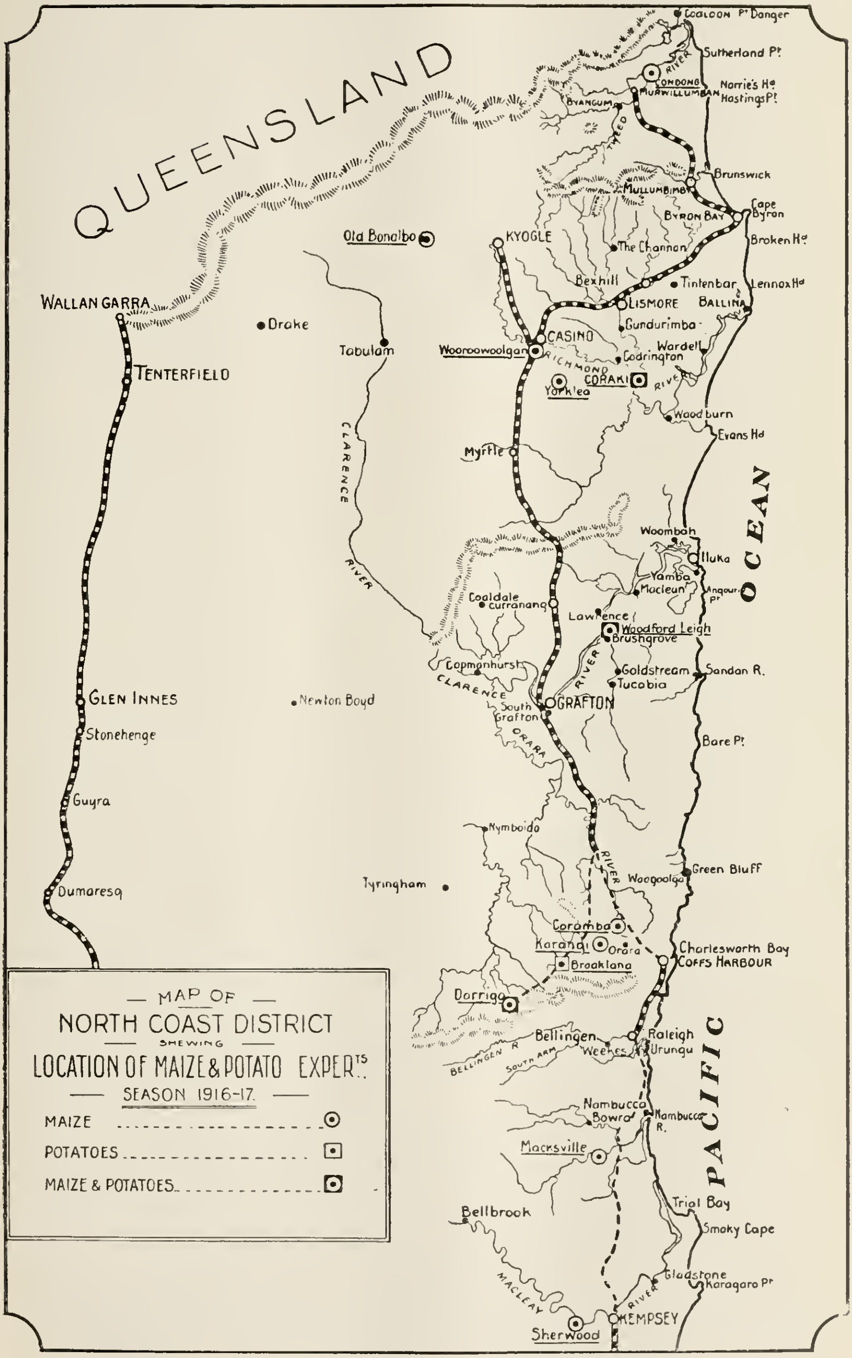
Sherwood.—This experiment was conducted upon a fairly heavy alluvial soil, which had been under cultivation for many years, and which had become badly infested with nut grass. Seeding was carried out on 13th October, 1916, favourable weather following. The growth of all varieties was rapid until the tasselling period of the early varieties, when a spell of dry windy weather was encountered. Throughout the growing season at Sherwood much drier conditions prevailed than at other centres, although the rainfall was ample for all requirements. To these dry conditions may be largely attributed the better showing made by the three varieties introduced from Queensland, those being the varieties most severely attacked by Leaf Blight at centres where that disease was prevalent. It is possible also that higher yields would have been secured at Sherwood had the after-cultivation been as complete as on the other plots, but, owing mainly to pressure of other work, the nut grass was permitted to obtain rather a firm hold. The rainfall recorded during the growing period was as follows:—October, 1916, 196 points; November, 487; December, 435; January, 1917, 449; February, 112; March, 329. Total, 20·08 inches.

Macksville.—The site of this experiment was a low-lying, indifferently drained, fairly heavy alluvial flat, having an elevation of only a few feet above salt water, and rather badly infested with Water Couch grass, but typical of the arable areas of the lower reaches of Warrell Creek.

The paddock had been utilised for growing a crop of oats for winter fodder, and in preparation for the maize experiment the residues were ploughed under towards the end of August. Early in October the land received another ploughing and heavy harrowing, and was again lightly ploughed and harrowed three days before planting. The strong growth of Water Couch rendered this complete system of preparation essential. The experiment was sown on 31st October, 1916. As at other centres, difficulty was experienced in executing the after-cultivation, but the plots were scuffled on 25th November, and hilled with the plough on 9th December. By these means the plots were kept comparatively free from grass and weeds, and maintained in a healthy condition throughout. Although at no period of their growth had these plots exhibited the vigorous appearance presented by those in more favourable situations, a satisfactory stand was maintained until the appearance of Leaf Blight. It may be noted that a good increase was secured at this centre by the use of artificial manures. At all periods of growth the manure plots showed to marked advantage over the unmanured, even in the case of the plot to which 1 cwt. superphosphate was applied, and which ultimately yielded less than the unmanured. Rainfall:—November, 1916, 453 points; December, 455; January, 1917, 383; February, 298; March, 465; April, 238. Total, 22·92 inches.

Karangi.—This experiment was conducted upon a sandy alluvial soil that has been cropped with maize regularly for twelve years, the usual practice being to sow Italian Rye grass through the crops at the final cultivation to ensure early spring grazing for the dairy herd. The plots were sown on 8th November, 1916, and the usual good germination followed. The growth of all varieties was maintained until into the new year, when Leaf Blight made its appearance, and Kansas Sunflower, Hildreth, and Hiawatha almost succumbed to the attack. The ravages of this disease were more marked at Karangi than elsewhere. The outstanding feature of the variety trial was the performance of Leaming, which outyielded Improved Yellow Dent by 23 bushels. In the manurial trial the most phenomenal increases, due to the use of artificial manures, were shown. Rainfall:—November, 1916, 1,040 points; December, 585; January, 1917, 563; February, 268; March, 246; April, 164. Total, 28·36 inches.

Coramba.—The experiment at this centre was conducted upon a dark and somewhat heavy alluvial soil that had been under paspalum for twelve years. The grass sod was broken up in November, 1915, and a crop of sorghum was grown during the autumn following. The preparations for the maize plots were very complete, the initial ploughing being given early in August, when



— MAP OF —
NORTH COAST DISTRICT
SHEWING
LOCATION OF MAIZE & POTATO EXPER^TS.
SEASON 1916-17.

all the débris of the previous crop was carefully turned under. The fallow received adequate attention, and on 9th November, 1916, when the experiment was sown, the seed-bed was in the most perfect condition. As was to be expected, the germination was excellent. In the case of Giant White, however, a somewhat thin stand was secured, owing to difficulties regarding the plates of the seed drill. During the whole of the growing season no grass or weeds were to be found throughout the plots, for in spite of constant spells of wet weather the work of cultivation was kept thoroughly in hand. Early in February there was a pronounced appearance of Leaf Blight in the Hildreth and Hiawatha plots. Giant White was also subjected to a slight attack of the same disease. Up to this stage the plots had presented a very pleasing appearance, the growth of all varieties having been satisfactory and very uniform throughout. Rainfall:—November, 1916, 1,028 points; December, 563; January, 1917, 524; February, 245; March, 224; April, 121. Total, 27·05 inches.

Dorrigo.—This experiment was carried out on a deep, friable, red volcanic soil, characteristic of the most favoured areas of the plateau. The planting was done on 11th November, 1916, and was followed by a period of dry windy weather, which, owing to the very porous nature of the soil, had a retarding effect upon germination. Later, however, a good stand was secured, and a successful growth was maintained until late summer, when the abnormal amount of showery weather and the corresponding absence of sunlight provided conditions highly favourable to the development of Leaf Blight, with the result that practically all varieties were severely attacked, and greatly diminished yields resulted. The only variety to show absolute resistance to the disease was Leaming, though the crossbred, Funk's Yellow Dent x Leaming, was only lightly infected; both varieties, however, showed signs of weakness, due probably to the need of sunlight. The cultivation of this experiment was somewhat restricted, owing to the fact that the paddock was a new one and consequently full of stumps; a satisfactory condition was maintained notwithstanding. The excessive rainfall recorded at this centre was as follows:—November, 1916, 595 points; December, 1,254; January, 1917, 1,290; February, 805; March, 557; April, 256. Total, 47·57 inches.

Woodford Leigh.—This experiment was on a heavy alluvial soil that has been under cultivation for upwards of sixty years, being cropped to maize and cane. The preparation of the seed-bed was uniform with that adopted at other centres. Seeding was carried out on 22nd November, 1916, and the after-cultivation was done with scuffler and disc-hiller, but owing to the unusually heavy potato harvest engaging efforts elsewhere, convolvulus, with which the Lower Clarence is rather badly infested, was able to make considerable headway, and somewhat diminished yields resulted. Leaf Blight made its appearance during the late summer, but the damage created was comparatively slight. The outstanding feature of the experiment was the yield given by Leaming, which was 11¾ bushels per acre greater than that of the Improved Yellow Dent plot. This is the more surprising, as the latter variety had hitherto given best results in this district; furthermore, the planting was done in November, which is the most favourable month for Improved Yellow Dent. Rainfall :—November, 1916, 120 points; December, 564; January, 1917, 477; February, 419; March, 535; April, 87. Total, 22·02 inches.

Yorklea.—This experiment was situated on a black volcanic ridge having a deep and friable soil. This particular portion of Yorklea might almost be termed plain country, the fall being very slight; originally it was but sparsely timbered, and it has been ringbarked for upwards of forty years. Mainly owing to the wet conditions experienced towards the end of 1916, the sowing of the experiment was delayed until 28th December, 1916, which may be taken as a probable cause of the failure of Red Hogan. The early months of 1917 were marked by a heavy rainfall, but in spite of this a very creditable state of cultivation was maintained. At an early stage of growth the manured plots showed to marked advantage over the unmanured, and this advantage was maintained throughout. A perusal of the figures relating to this experiment will show that, with the exception of the plot where superphosphate was applied at 1 cwt. per acre, increased yields were given by all manures. The Yorklea experiment was marked by the total failure of all varieties, with the exception of Improved Yellow Dent and Leaming. Rainfall :—January, 1917, 555 points; February, 210; March, 525; April, 30. Total, 13·20 inches.

Cultivation.

The mode of preparation throughout the trials showed a marked uniformity. The soundness of the principles underlying the practice of fallowing is now so universally recognised that no difficulty was experienced in securing the co-operation of the experimenters in having an early and thorough preparation of the soil. In every instance the first ploughing was given before the end of winter, and the soil exposed to the mellowing effects of frost and sun. The fallow received adequate attention, and in every instance the seed was sown on a perfectly satisfactory seed-bed. The methods of planting differed slightly, in that, while at Coramba, Sherwood, and Woodford Leigh seed drills were available, at other centres recourse had to be had to the plough and harrow. It should be noted that the results were equally satisfactory under both systems, the former possessing the advantage of speed. The "drop" was identical throughout the trials, viz., three grains every 30 inches, but the width between the drills varied from 4 feet 4 inches to 4 feet 6 inches.

In every case the germination was good, and the experimenters are to be congratulated upon the success of their efforts in keeping the plots free from weed growth, and in maintaining the soil in that open healthy condition so necessary in the cultivation of maize. The cultural operations were fraught with some difficulty owing to the continuous spells of wet weather, but keenness and judgment were displayed, and the objective was attained in most instances. Where possible, a harrowing was given before the plants had attained a height greater than 5 inches, and this was followed by continuous attention with scuffler or disc-hiller. At Macksville and Karangi it was deemed necessary to plough through the crop, but at all other centres this was avoided by the use of the disc-hiller.

The Season.

The maize season 1916–17 can hardly be regarded as being a wholly satisfactory one. While in every instance ample moisture was forthcoming to give a good germination and strong aftergrowth, unfavourable weather conditions experienced during the early part of 1917 were responsible for an outbreak of Leaf Blight that, except at Sherwood, affected all the experiments with greater or less severity. The attack was particularly marked at Dorrigo, Karangi, and Macksville, and greatly diminished yields resulted in every instance. The disease would appear to be influenced mainly by the weather, and developed rapidly under the dull showery conditions obtaining at this time. It is a significant fact that in every instance immunity was displayed by Improved Yellow Dent and Leaming. As these varieties are grown on the Grafton Experiment Farm, strength is given to the assumption that immunity follows acclimatisation. Furthermore, in many instances, as the plots approached maturity the moisture present in the soil was more than ample for their requirements, and the usual sickly appearance was manifestly accentuated, at least at Dorrigo, by the abnormal absence of sunlight.

Farmers' Varieties.

Three local or farmers' varieties were included in the trials. At Sherwood, the local maize was that known as Macleay White, which is very similar but an inferior grain to the Giant White used throughout the experiments. It will be noted that this variety gave a slightly greater yield than the introduced Giant White, but as acclimatisation invariably brings about a substantial increase, it is more than probable that the positions could be reversed.

At Dorrigo the local maize was small Red Hogan, a variety that has been grown on the plateau for a number of years, and which has there a period of maturity equal to that of Leaming. In spite of the fact that this variety outyielded Leaming in the Dorrigo experiment, the consensus of opinion is that Leaming is the maize of the future for the plateau. It was anticipated that a thoroughly acclimatised maize would withstand the rigours of an abnormal season with greater success than one grown under strictly coastal conditions.

At Yorklea the local variety was one bred by Mr. S. G. Shepherd, of Springrove, and known as "Springrove Surprise." This variety has won considerable popularity about Casino, and has the reputation of yielding well under the soil and climatic conditions of that district. It has a very narrow and deep grain, pale yellow in colour, but rather light in weight. The results obtained at Yorklea should not be regarded as being altogether conclusive, as the seed was a rather poor sample. It is proposed, however, to conduct further trials with this variety during the coming season, and for this purpose Mr. Shepherd has supplied a quantity of selected seed.

TABLE A.—Showing Results of Maize Variety Trials, North Coast, 1916-17.

	Coramba.		Dorrigo.		Woodford Leigh.		Sherwood.		Yorklea.		Karangi.		Macksville.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Improved Yellow Dent	66	40	......		61	27	52	44	47	52	46	24	57	28
Leaming	54	8	35	12	73	16	51	16	40	48	69	0	49	16
Gold Standard Leaming	......		21	34	......		43	40	......		40	40	23	32
Kansas Sunflower ..	......		......		......		40	16	......		22	4	22	8
Hildreth	33	22	......		40	43	36	48	......		26	16	31	24
Hiawatha	35	48	......		26	50	37	4	......		25	16	23	18
Hickory King	......		......		......		42	0	18	0	27	48	......	
Giant White	42	24	......		47	14	41	20	15	52	43	36	32	48
Goldmine	......		28	44	......		......		15	12	......		......	
All Gold	......		......		......		......		16	48	......		......	
Red Hogan	......		......		......		......		31	48	......		......	
Silvermine	......		16	0	......		......		......		......		......	
Boone County Special ..	......		18	32	......		......		......		......		......	
Reid's Yellow Dent ...	......		18	24	......		......		......		......		......	
Early Yellow Dent ...	....		18	24	......		......		......		......		......	
Funk's x Leaming ...	....		36	44	......		...		......		......		......	
Farmer's Variety ...	......		40	40	......		43	48	28	42	......		......	

The Farmers' Varieties were :—Dorrigo, small Red Hogan (local) ; Sherwood, Giant White (local) ; Yorklea, Springrove Surprise.

The Results.

A glance at the statement of results will show that sixteen varieties underwent trial on the North Coast last season. Of these, however, eight were limited to the Dorrigo and Yorklea plots. The outstanding feature of the whole series is the wonderfully even performance of Improved Yellow Dent and Leaming. Through six different experiments, covering a wide range of soils and conditions, these two varieties stood quite alone, and the results gained only serve to emphasise the fact that up to the present no maize has been found to challenge their superiority for the North Coast. No other variety made what can be accepted as even a moderate success in comparison with these two. Several are, however, worthy of note.

The crossbred *Funk's* x *Leaming* created a good impression at Dorrigo, where it successfully withstood the rigours of the season, and, indeed, outyielded Leaming by 1½ bushels per acre. It is unlikely to compete against the last-named to any extent, however, its characteristics rendering it unsuitable for coastal conditions.

Gold Standard Leaming, while failing at Dorrigo and Macksville, yielded more satisfactorily at Sherwood and Karangi. It is proposed to conduct extensive trials with this variety on the North Coast this coming season.

Kansas Sunflower was tried at three centres, and while failing at two, gave fairly good results under the drier conditions obtaining at Sherwood, where it produced a nice sample of grain. This was the variety most severely attacked by Leaf Blight, and at Karangi and Macksville it almost succumbed to the ravages of the disease.

Hildreth and Hiawatha.—At none of the plots did these approach to within measurable distance of the yields of the approved varieties. They suffered only slightly less severely than Kansas Sunflower from the attacks of Leaf Blight. Possibly under drier conditions they would have yielded more heavily. Hiawatha is apparently peculiarly susceptible to attack by weevils, and for this reason, apart from any others, is extremely unlikely to become popular on the North Coast. At seeding it was observed that in every instance the Hiawatha seed was more or less weevily, while all the other varieties were entirely free from this pest.

Giant White.—It will be noted that on the whole this variety yielded consistently. At Karangi it approached to within 3 bushels per acre of Improved Yellow Dent. It is worthy of trial on soils of moderate fertility, and is gaining popularity in several districts on that account.

Hickory King was tried at three centres, and only at Sherwood did it yield satisfactorily. This variety is likely to retain its popularity from its wonderful hardiness, which makes maize-growing possible on very poor soils. The figures submitted would indicate that it is an unprofitable maize to cultivate on fertile areas.

Goldmine.—It was anticipated that this variety would have performed well at Dorrigo, and it will be seen that it withstood the adverse conditions experienced at this centre relatively better than Silvermine, Boone County White, Early Yellow Dent, and Reid's Yellow Dent. In a more favourable season it is believed that it will prove very satisfactory.

The Fertiliser Trials.

Manurial experiments were carried out in conjunction with the variety experiments, and the results of these are set out in the accompanying table.

For comparative purposes, the yields secured at each centre are arranged in columns, and in the column adjoining will be found the amount of profit or loss per acre arising from the use of each manure. In drawing up this statement, an allowance of 3s. per bushel was made for the maize, and the fertilisers were charged as follows:—

Superphosphate, 4s. 11d. per cwt.
P5, 1¼ cwt. per acre, 9s. 3d. per acre.
P7, 2 cwt. per acre, 15s. per acre

In the case of Dorrigo, an additional 2s. 6d. per cwt. is added to cover cost of haulage from Bellingen.

At Dorrigo and Sherwood, Leaming was the variety used for the manurial experiment, while at all other centres Improved Yellow Dent was selected for the purpose.

Perusal of the results of the experiments reveals the fact that on the old soil of Woodford Leigh artificial manures are a total failure. This is borne out by the results of former experiments. At Sherwood the superphosphate plots each returned a profit, but a considerable loss was sustained on the P5 and P7 plots. With the exception of Dorrigo, where the trials were almost completely upset by seasonal difficulties, the remainder of the series is strongly in support of artificial manures.

TABLE B.—Showing the Results of Maize Manurial Trials, North Coast, 1916-17.

Manure and Amount.	Coramba.		Dorrigo.		Woodford Leigh.		Sherwood.	
	Yield per acre.	Profit from manure.	Yield per acre.	Profit from manure.	Yield per acre.	Profit from manure.	Yield per acre.	Profit from manure.
	bus. lb.	s. d.	bus. lb.	s. d.	bus. lb.	s. d.	bus. lb.	s. d.
Superphosphate, 1 cwt. per acre.	65 24	(—) 8 9	37 34	0 8	54 15	(—) 26 8	53 8	0 8
Superphosphate, 2 cwt. per acre.	73 32	10 9	40 0	(—) 0 8	59 40	(—) 15 1	59 8	13 9
P5 Mixture, 1¼ cwt. per acre.	72 24	7 10	43 12	11 7	56 5	(—) 25 4	47 32	(—) 20 6
P7 Mixture, 2 cwt. per acre.	75 16	10 8	38 20	(—) 10 7	65 5	(—) 4 2	48 32	(—) 23 3
No manure	66 40	......	35 12	......	61 27	......	51 16	......

Manure and Amount.	Yorklea.		Karangi.		Macksville.	
	Yield per acre.	Profit from manure.	Yield per acre.	Profit from manure.	Yield per acre.	Profit from manure.
	bus. lb.	s. d.	bus. lb.	s. d.	bus. lb.	s. d.
Superphosphate, 1 cwt. per acre ..	42 48	(—) 20 2	64 48	50 4	51 44	(—) 12 2
Superphosphate, 2 cwt. per acre ..	57 4	17 7	72 24	73 2	69 16	25 5
P5 Mixture, 1¼ cwt. per acre ..	72 16	63 10	69 16	57 4	71 16	32 0
P7 Mixture, 2 cwt. per acre.. ..	55 20	7 3	90 12	116 3	66 24	11 9
No manure	47 52	......	46 24	......	57 24	......

(—) signifies loss.

The following details may be of interest:—

Superphosphate, 1 cwt. per acre.—It will be noted that in four instances a direct loss attended the use of 1 cwt. of superphosphate per acre, on two others the gain was inappreciable, and even at Karangi, where phenomenal results were secured, the plot was completely overshadowed by the yields from the other plots where fertilisers were tried. The results obtained from 1 cwt. of superphosphate are somewhat contradictory to those of former years, and it will be necessary to make further experiments along these lines before a definite decision can be arrived at.

Superphosphate, 2 cwt. per acre.—The increased application invariably gave a marked increase in yield, as against 1 cwt. Though applied with a financial loss at Dorrigo and Woodford Leigh, it was the only manure to show a profit at Sherwood, and as far as these figures go, the larger application can be recommended for general use.

P5 (consisting of 80 per cent. superphosphate and 20 per cent. sulphate of potash).—One of the features of the manurial trials was the success attained by this mixture at Yorklea. It was anticipated that a good response would be made to a potash manure at this centre, but it will be noted that an even performance is recorded throughout the whole of the series. When fertilisers of this type are again available, their use can be strongly advised.

P7 (consisting of equal quantities of superphosphate and bone-dust).—On the whole, P7 yielded less satisfactorily than 2 cwt. superphosphate. It is usually regarded as being a very safe and reliable mixture, and further trials are to be made during the coming season. It is to be hoped that results of a more comprehensive character will be available later. P7 met with an astonishing success at Karangi, almost doubling the yield of the unmanured plot.

Northern and North-Western Districts.

R. W. McDIARMID, Inspector of Agriculture.

The following farmers of the North and North-Western portions of the State co-operated with the Department in conducting the maize experiments last year:—

J. T. Elliot, Dangarsleigh, Armidale.
T. Farlow, Red Range, Glen Innes.
J. F. Chick, Hill View, Tenterfield.
J. T. Cowin, Bryan's Gap, Tenterfield.
Harding Brothers, Oakwood, Inverell.

The experiments consisted of both variety and fertiliser trials, the latter comprising ordinary applications at sowing time and top-dressing at flowering. Generally speaking, the season was too wet, with insufficient hot weather for best maize growth. Early frosts were also experienced, which killed the naturally backward and unripened crops. The frosts were much earlier and more severe than usual, and caused an enormous reduction in yield throughout the North and North-West. In most instances in the North the grain was still in the milky stage, and in consequence it pinched and shrivelled very much. Only the very early maturing varieties were successful in the New England districts. The cool, wet season also produced a grain that was considerably smaller than usual, and inferior to the typical sample. The outstanding variety was Early Yellow Dent, though the quality was not up to the standard.

The Armidale Plots.

The soil here was heavy black basaltic, and of fair fertility. It was cropped with maize the previous year, and had been sown without manure. It was ploughed early in June, and again ploughed and harrowed in October. The seed was drilled in on 3rd November without manure. The rows were 3 feet 8 inches apart, and two grains were sown every 2 feet. The germination and early growth was very good throughout the plots, but a very severe hailstorm early in January was responsible for much damage and an apparent loss in yield. Fortunately the crop had not flowered, otherwise greater loss would have resulted. Good returns were anticipated until early in April, when severe frosts occurred throughout the North and killed all the maize crops. Early Yellow Dent was the only variety nearing maturity, and it naturally gave the best return. This variety is rapidly gaining favour, and is replacing the older and later varieties more generally grown in the district. The following table shows the varieties grown and yields harvested from the Armidale plots:—

TABLE I.—Showing Results of Maize Variety Trials at Armidale, 1916-17.

Variety.	Yield per acre.	
	bus.	lb.
Leaming	12	37
Funk's Yellow Dent	12	38
Early Yellow Dent	19	16
Reid's Yellow Dent	8	30
Gold Standard Leaming	13	3
Goldmine	13	5
Silvermine	13	49
As You Like It	4	33
Funk's x Leaming	9	40
Chester County	8	24

Date sown, 3rd November, 1916; date killed by frost, 9th April, 1917.

Little can be said concerning the new varieties under trial except that they are later than Early Yellow Dent and probably not so reliable for the district. The Silvermine and Goldmine matured next to Early Yellow Dent, and were next best in yield.

The Red Range Plots.

The plots here consisted of variety and manurial trials, and were sown on rich dark basaltic soil following a crop of oats of the previous year.

The land was ploughed in April, and was later spring-tooth cultivated. In August it was again ploughed, and cultivated twice in September and October to kill weeds. After sowing on 7th November, it was harrowed to check the weeds. The seed was drilled in rows 3 feet 8 inches apart, three grains being dropped every 3 feet 6 inches, using 10 lb. of seed per acre. There was a splendid germination in all the plots, and the young maize got ahead of the weeds. The wet season that followed prevented the proper working of the soil and destruction of weeds, and also made it impossible to carry out the top-dressing as arranged for with one plot. Very satisfactory returns were expected from all the plots until early in April, when the plants were killed by severe frosts. The Early Yellow Dent was nearly ripe enough, and consequently was affected least of all. The following table shows the results:—

TABLE II.—Showing Results of Maize Trials at Red Range, 1916-17.

Variety	Kind and Amount of Manure per acre.	Yield per acre.	
		bus.	lb.
Funk's Yellow Dent ...	½ cwt. superphosphate...	43	0
Prairie Queen	½ ,, ,, ...	45	0
Gold Standard Leaming ...	½ ,, ,, ...	38	28
Early Yellow Dent ...	½ ,, ,, ...	40	0
,, ,, ...	1 ,, ,, ...	41	42
,, ,, ...	1 cwt. superphosphate and bone-dust ...	45	0
,, ,, ...	70 lb. P5 mixture	42	28
,, ,, ...	No manure	41	7

These yields are very satisfactory considering the season experienced.

The rainfall was not registered near the plots, but was undoubtedly more than requirements. The season likewise affected the results obtained from the different fertilisers, and although an advantage was apparent from its use, the results cannot be considered conclusive.

The Tenterfield Plots.

The location of the two experiments in this district has already been stated, the soil at each place being somewhat similar and typical of the district.

At Mr. J. F. Chick's farm the land had carried a crop of barley and maize, for green feed, the previous year. Ploughing was done in August, and this was followed by cultivating and harrowing in September and again in October. The seed was drilled in on 25th October, with a cultivation during the operation. The drills were 4 feet apart, with the grains 16 inches apart in them. Superphosphate, at the rate of 1 cwt. per acre, was used throughout the plots. Good yields appeared likely until early in January, when the plots were severely damaged by a terrific hailstorm. The crop was just starting to flower, and although it made a wonderful recovery the ultimate yields must have been very considerably reduced.

The following table shows the varieties grown and the yields obtained from each.

TABLE III.—Showing Results of Maize Variety Trials at Mr. J. F. Chick's farm, Tenterfield.

Variety.	Yield per acre.	
	bus.	lb.
Early Yellow Dent	28	10
Funk's Yellow Dent	30	18
Prairie Queen	29	22
American Wonder	27	30
Chester County	27	31
Silvermine	16	0

The results place Funk's Yellow Dent and Prairie Queen ahead of the earlier varieties, which is probably the result of the hailstorm, for, no doubt, the early varieties, through being more forward, were affected more. The Easter frosts also reduced the yields to some extent. The rainfall registered at Mr. Chick's indicates the nature of the season at Tenterfield. The following monthly falls are those of the growing period :—November, 1916, 365 points; December, 355; January, 1917, 680; February, 365; March, 222. Total, 19·87 inches.

At Bryan's Gap the land had been cropped with oats during the previous year. After providing feed for the cows the land was ploughed in June, harrowed in September, and cultivated early in October and again at drilling time on 20th October. The seed was drilled in rows 4 feet apart, using 8 lb. of seed per acre. The growth was very good throughout, and the crops were almost mature when they were frosted early in April. Funk's Yellow Dent was affected more than the others. The growing crop was cultivated on 16th November, hilled 14th December, and finally cultivated on 12th January, 1917. In the top-dressing experiment the fertiliser was scattered by hand between the drills, and cultivated into the surface soil on 12th January.

TABLE IV.—Showing Results of Maize Trials at Mr. J. T. Cowin's farm, Tenterfield, 1916–17.

Variety.	Kind and Amount of Manure per acre.	Yield per acre.	
		bus.	lb.
Funk's Yellow Dent ...	No manure	19	48
,, ,, ...	½ cwt. superphosphate	24	12
,, ,, ...	*½ cwt. superphosphate and 70 lb. P5 mixture	34	46
,, ,, ...	1 cwt. superphosphate...	26	6
,, ,, ...	70 lb. P5 mixture	19	38
,, ,, ...	1 cwt. superphosphate and bone-dust ...	14	37
Early Yellow Dent ...	1 cwt. superphosphate...	25	0
Iowa Silvermine ...	1 ,, ,, ...	26	6
Funk's x Leaming ..	1 ,, ,, ...	30	0

* The 70 lb. P5 mixture was added as a top-dressing on 12 January, 1917.

The yields here are very satisfactory considering the season, and the comparisons in the fertiliser plots very valuable. The increases due to the application of ½ cwt. and 1 cwt. of superphosphate per acre being 5 and 7 bushels per acre respectively, while the use of ½ cwt. of superphosphate at sowing, and 70 lb. P5 mixture at flowering resulted in an increase of 15 bushels per acre over the unmanured plot. The P5 mixture at sowing time, and bone-dust and superphosphate mixed, both returned diminished yields. The following rainfall was recorded near the plots during the growing period :—November. 1916, 217 points ; December, 265 ; January, 1917, 270 ; February, 22 ; March, 245. Total, 10·19 inches.

The Inverell Plots.

These plots were established in the Oakwood portion of the district on red loamy soil. The land was cropped with oats the previous year. It was ploughed in August, and again in September, and subsequently harrowed down. The seed was drilled in at the rate of 8 lb. per acre on 25th and 26th October, the rows being 4 feet 6 inches apart, single grains being dropped every 16 inches in the drills. The germination was perfect, and subsequent growth very good, and the crop practically ripe when the heavy Easter frosts were experienced. These frosts resulted in pinched grain with all varieties except Early Yellow Dent.

Table V.—Showing Results of Maize Trials, Inverell, 1916–17.

Variety.	Kind and Amount of Manure per acre.	Yield per acre.	
		bus.	lb.
Funk's Yellow Dent ...	No manure	42	43
,, ,, ...	1 cwt. superphosphate	49	21
,, ,, ...	½ ,, ,, ...	46	19
,, ,, ...	1 cwt. superphosphate and bone-dust ...	46	24
,, ,, ...	70 lb. P5 mixture	49	11
Early Yellow Dent ...	No manure	46	44
Gold Standard Leaming ...	,, ...	46	54
Silvermine...	,, ...	41	9

The use of artificial fertiliser has given an increase in yield in each instance, being from 4 to 7 bushels per acre.

The rainfall was not recorded in the vicinity of the plots. However, it was on the whole a suitable season for maize at Inverell, though perhaps a little too wet.

General Conclusions.

From the year's experiments it is evident that sowing should be completed in the New England districts by the end of October, and the quickest maturing varieties should be used. In the fertiliser trials the advisability of applying superphosphate at sowing time is fairly well demonstrated, as the following summary shows :—

Fertiliser per acre.	Red Range.		Tenterfield.		Inverell.	
	bus.	lb.	bus.	lb.	bus.	lb.
Nil	41	0	19	48	42	43
½ cwt. superphosphate	40	0	24	12	46	19
1 ,, ,, ...	41	42	26	6	49	21
1 cwt. superphosphate and bone-dust ...	45	0	14	37	46	24
70 lb. P5 mixture	42	28	19	36	49	11

The top-dressing at flowering time has given a large increase at Tenterfield, but one year's results cannot be regarded as conclusive.

FIXED PRICE FOR SULPHATE OF AMMONIA.

For some time past there has been a shortage in the local supply of sulphate of ammonia, and the Federal Authorities prohibited the exportation of this commodity, except under certain conditions, from the Commonwealth.

Arrangements have been made with producers of sulphate of ammonia to keep local requirements fully supplied, and the price has been fixed in all the States, except Queensland, at £18 per ton, and in Queensland, at £19 per ton.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1916–17.

North Coast District.

G. C. SPARKS, Assistant Inspector of Agriculture.

VARIETY and manurial trials were conducted on four farms, the distribution being as follows, and as indicated on the map on page 15:—

John Wilson, Coramba.
F. Want, Woodford Leigh, Clarence River.
Henry Short, Dorrigo.
F. Allard, Brooklana, Eastern Dorrigo.

The Season.

At Coramba and Woodford Leigh the season left little to be desired, except that at the former place the month of October, as is usual on the North Coast, proved slightly dry. Favourable weather obtained throughout the period of preparation, and as a result the tilth at seeding-time was good. Germination was satisfactory, and the after-cultivation adequate. Irish blight made an appearance at Woodford Leigh, but as the outbreak was a very mild one it is unlikely that yields were reduced thereby.

The Dorrigo and East Dorrigo experiments encountered unfavourable weather, however, in that the dull showery conditions experienced on the plateau provided a particularly good medium for the development of Irish blight, and as a result the plots suffered severely.

Cultivation.

At each centre the usual early ploughing was given, and the fallow was kept in order by harrowing. Seeding operations differed slightly. At Coramba and Woodford Leigh the sets were ploughed in, but on the Dorrigo drills were made and the sets covered by the return furrow. This system gives good results on wet situations, the slight ridge that is thrown on to the sets acting as a protection. Throughout the trials germination was good. Where possible two harrowings were given, followed by successive workings with the scuffler, and eventually hilling with the plough.

Coramba.—This experiment was on a light alluvial soil that had been built up by good farming methods, including green manuring, until a high state of fertility had been obtained. Ideal conditions were thus provided, and this was supplemented by a thorough preparation of the seed-bed. The initial ploughing, 10 inches deep, was given immediately upon the harvesting of the maize crop early in July, all débris being turned under. The fallow received due attention, and at seeding the land received another good stirring, the crop being ploughed in. Satisfaction proved to be the only variety at fault as regards germination. As the season advanced the difference between the manured and unmanured plots became very distinct, the vegetative growth of the latter being extremely weak.

The plots throughout the growing period presented a particularly pleasing appearance. The work of cultivation was kept thoroughly well in hand at all times; and as a result, no weeds were able to gain hold and the soil was always in fine mechanical condition.

It will be noted that, in spite of a weak germination, Satisfaction was the heaviest yielding variety, being well ahead of its nearest rivals, and according to local authorities creating a record yield for the Coramba district. Taken as a whole, the experiment resulted in the production of a wonderfully even lot of potatoes, which for size and soundness would be difficult to beat; the single exception was the Up-to-Date plot, the tubers from which were somewhat uneven in point of size.

In the manurial section the increases brought about by the use of artificial manures were very marked, the P4 mixture giving the phenomenal increase of 3 tons 7 cwt. over the unmanured plot. Mr. Wilson cleared the whole of his crop at £10 per ton; allowing 36s. per acre for the manure, this result gives a gross profit of £31 15s. per acre.

The effective rainfall at Coramba was 1,644 points, distributed as follows:—August, 1916, 29 points; September, 229; October, 208; November, 1,028; December, 150.

Woodford Leigh.—This experiment was conducted upon a heavy alluvial soil, typical of the "back lands" of Woodford Island, and upon the same site as that of last season. The soil cannot be regarded as being ideal for potato culture, having been cropped for upwards of half a century, during which period a constant depletion of humus has been permitted, and it has acquired the characteristic of running together or "setting" to a marked degree after heavy rain.

Within a few hours of hilling a storm broke over the plots, thoroughly saturating the soil, which as a result became so consolidated that the tubers were unable to make adequate expansion, and the yields were minimised accordingly. From then onward the general appearance of the experiment became less satisfactory, growth being relatively weaker. Towards the end of October Irish blight appeared, but before this trouble became acute a spell of dry windy weather successfully checked it.

When harvesting the plots, the extraordinary "setting" of the soil was clearly manifest, for, in spite of an ample rainfall, free fertiliser was plentiful along the drills.

The variety trial at this centre resembled that at Coramba, in that Satisfaction, Manhattan, and Up-to-Date repeated their performances, although in a less degree. P4, however, was the only manure to give an increase.

The rainfall was:—August, 1916, 201 points; September, 420; October, 147; November, 154. Total, 9·22 inches.

The Dorrigo.—Both the Dorrigo and the Brooklana plots were first crops, the paddocks having been under paspalum for a short period following the felling and burning of the scrub. The Dorrigo experiment was on the loose, friable, red volcanic soil of the higher levels, and that at Brooklana on the heavier yellow soil of the eastern slope—both, it should be noted, typical of their district.

The history of these trials is almost identical—good germination and satisfactory vegetative growth until cool showery weather encouraged Irish blight. At Dorrigo the heaviest yield was given by Coronation, and comparatively good yields by Queen of the Valley and Surprise. An interesting fact is that Queen of the Valley, regarded as being blight-resistant, was one of the first to show symptoms of the disease.

The response of the virgin Dorrigo soil to artificial manures, as shown in the accompanying table, is interesting. The mixture P4 gave an increase of more than 60 per cent.; and the actual figures credit P5 with a much greater percentage at Brooklana, at which centre Satisfaction again proved its superiority.

The effective rainfall at Dorrigo was 30·85 inches, and at Brooklana 26·52 inches.

Conclusions.

It will be readily understood that after an exceptional season great care must be exercised lest conclusions of an erroneous nature be drawn, but it may be noted that at Dorrigo, Coronation put up a good performance under adverse conditions; and taking into consideration the reputation achieved by this variety at other centres, it can with reasonable safety be recommended for growth on the plateau. Further and more extensive experiments are being carried out during the coming season, and it is hoped that a large amount of definite data will be available in due course.

TABLE A.—Showing Results of Potato Variety Trials, North Coast, 1916.

	Coramba.				Woodford Leigh.				Dorrigo.				Brooklana.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q	lb.	t.	c.	q.	lb.
Early Manistee	4	9	2	8	2	2	1	4		....			0	7	1	25
Carman No. 1	5	6	3	4	2	0	2	24	1	0	0	0	0	16	2	12
Manhattan	8	0	0	0	4	8	3	2	1	18	1	6	1	6	0	16
Satisfaction	9	6	3	4	4	1	2	7		....			1	16	2	12
Up-to-Date	8	14	1	26	4	1	2	7	1	0	3	16	1	6	0	24
Surprise		....				....			2	2	1	18		....		
Queen of the Valley		....				....			2	7	2	20		....		
Coronation		....				....			2	14	1	4		....		
Early Rose		....				....			1	19	1	24		....		

Under truly coastal conditions, Manhattan and Satisfaction continue to hold their established positions. In the potato-growing districts there are practically no other varieties grown. Up-to-Date yielded well at Coramba and at Woodford Leigh, but it is unpopular on account of its tendency to produce a high percentage of small tubers.

On the whole, Carman No. 1 and Early Manistee were not successful. At Brooklana, however, they suffered most severely of all varieties from the blight, and it is anticipated that Early Manistee, at least, will prove satisfactory under more favourable conditions.

TABLE B.—Showing Results of Manurial Trials, North Coast, 1916.

	Coramba.				Woodford Leigh.				Dorrigo.				Brooklana.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate, 2 cwt....	7	6	2	22	3	19	3	24	1	16	0	16	1	7	1	16
P4, 3 cwt.	8	0	0	0	4	8	3	2	3	2	1	0	1	6	0	16
P5, 2½ cwt.	7	14	2	0	4	7	2	0	2	12	0	0	1	16	2	12
P6, 3 cwt.	....				....				2	5	2	18	....			
No manure	4	12	3	12	4	7	3	12	1	18	1	16	0	6	2	16

Manhattan was the variety used for these trials.

As regards the composition of the mixed fertilisers, one ton of each contains:—

P4—Sulphate of ammonia, 4 cwt.; superphosphate, 13 cwt.; sulphate of potash, 3 cwt.

P5—Superphosphate, 16 cwt.; sulphate of potash, 4 cwt.

P6—Bone-dust, 12 cwt.; superphosphate, 4 cwt.; sulphate of potash, 4 cwt.

Great success was achieved with artificial manures at Coramba, Brooklana, and Dorrigo. A loss of 2 cwt. per acre was experienced on the superphosphate plot at Dorrigo, but substantial increases were recorded from all other manured plots at the three centres.

Financial loss attended the manure experiments at Woodford Leigh. The cost of the manure was more than enough to absorb the increase brought about by the P4 dressing, and actual decreases of yield were recorded at the other plots. This experiment cannot be regarded as conclusive, however. It has been suggested that the presence of free fertilisers in the drills has a detrimental effect upon the crop, and observations during a normal season have revealed an extremely unsatisfactory soil condition. The subject of green manuring is one that should receive careful consideration, particularly from farmers on the older soils. It can be regarded as quite certain that in a comparatively short time this system would bring about a pronounced change for the better and induce a condition responsive to artificial manures.

On the Clarence River "old timers" proclaim unquestionable signs of a return of the wet seasons and a consequent permanent flooding of the swamps. As it is upon these areas that the bulk of the Clarence River potato crop is produced, it is possible that the need for green manuring may become more acute if the output is to be maintained.

Weeds of New South Wales.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director of the Botanic Gardens, Sydney.

Thorn Apple or False Castor Oil Plant (*Datura Stramonium* L.).

Botanical description.—A rather tall bushy annual. Leaves ovate, angular, irregular toothed or lobed. Flowers solitary, shortly pedunculate. Calyx loosely tubular. Corolla funnel ("trumpet") shaped, above 3 inches long, white. Capsule nearly globular, very prickly.

Popular description.—A somewhat succulent, bright green, heavy-smelling herb of 2 or 3 feet high, growing in waste places. The leaves are rather large, irregularly cut or toothed, and paler on the underside. Flowers large, white, usually described as trumpet-shaped. The fruit (the "prickly pod" of farmers) is rather large, much rougher than a nutmeg grater, and it sheds a large number of black, kidney-shaped seeds which have little dots over them.

Other species.—Ewart and Tovey ("Weeds, &c., of Victoria") have a figure of *Datura Stramonium*; while in the *Queensland Agricultural Journal* for July, 1917, p. 31, C. T. White has useful notes on and photographs of *Datura Tatula*, the Purple Thorn Apple (a species with purple stems which is obtaining a rather firm hold in the colder parts of New South Wales), *D. ferox*, a Thorn Apple new to Queensland, and *D. Metel*, the Hairy Thorn Apple, not uncommon in Queensland, but not an escape in New South Wales, as far as I know. There is also a native species of *Datura*, viz., *D. Leichhardtii* F.v.M., which is confined to Queensland.

Common Names.—In the Jerilderie case, to be presently referred to, the local doctor informed me that the plant was known as "Wild Castor-oil Plant." Throughout the greater part of New South Wales its most common name is "Castor Oil" without any qualification, and I will presently show how regrettable the use of this name is, causing the greatest confusion. Confusion of name is especially to be regretted when a poison-plant may be referred to. In most English speaking communities it goes under the name of "Thorn Apple," and I would like to see the use of this name encouraged by people who find *Datura* too much for them. In the United States it has other names, which I have not seen used in Australia and which need not be mentioned here, except "Jimson Weed" (a contraction of "Jamestown Weed," from the North Carolina town), which is much employed in American literature.

Confusion with the True Castor Oil Plant.—A few years ago I started a discussion in the papers as to whether this plant is poisonous, and to what extent. The statements made were most of them very interesting, and I tried to sift them out into (*a*) Thorn Apple or False Castor Oil Plant (*Datura Stramonium*) and (*b*) True Castor Oil Plant (*Ricinus communis*).

Most of the correspondents referred to the Thorn Apple; a few, including the following, evidently referred to the True Castor Oil Plant :—

From the contradictory evidence given, would it not be possible to suppose that its poisonous properties depended somewhat on the district in which it grew? Although introduced into the Loyalty Islands, its medicinal properties are well known there. The natives, and also the Europeans, will chew from half to a whole seed, throwing away the residue. In New South Wales, on the other hand, I know of an instance where only a small portion of a seed was eaten, resulting in terrible pains in the abdomen, accompanied by violent vomiting. The plant is of great use for shade purposes in poultry runs, where I have seen the young leaves eaten off with no ill-effects.

The following two I will not be certain about, although I can make a guess, as the True Castor Oil Plant is far more sensitive to cold than the Thorn Apple. They were probably the latter.

I distinctly remember that on one occasion, about two seasons ago, cattle ate down quite a large and well-grown patch of this plant without suffering any ill effects whatever. They left only stalks about, from 1 foot to 18 inches high. I cannot clearly recollect, but I think the plants could not have reached beyond the flowering stage.—("Guabinga," Terra Bella, *via* Wellington, 21st November, 1907.)

In a recent *Agricultural Gazette* you inquired of readers whether cattle ate the wild castor oil plant. I state positively that they eat it in all its stages of growth, and after it is dead. As to its effects, I may say that I saw twelve head of young cattle (out of a travelling mob) die within an hour after eating dry castor oil, and last autumn, after turning a six months' heifer out of a yard that it had been in all night without food, I found it dead in a patch of dry castor oil close by shortly after. It appears to me to be very fatal to hungry stock. I have seen my sheep eating both dry and green, also rabbits eating the small young plants.—(Murga, 6th January, 1908.)

Further classification of the evidence.—(1) *Evidence that stock eat the weed* (*Thorn Apple*), *but that it does not poison them* :—

Mr. E. W. Turner, jun., writes :—In reply to Mr. Maiden's inquiry whether stock will eat castor oil weed, I have seen sheep eat the dry pods freely. I could not guarantee there were many, or even any, seeds in the pods, but can swear to the pod-eating all right. Of 1,000 sheep running amongst castor oil for a fortnight, only two died, and as most of the mob were eating the pods, I could not understand why it should affect some and not others. The paddock in which the sheep were had plenty of castor oil and a fair amount of grass. The identity of castor oil cannot easily be mistaken, because, no matter what name it goes under, it always has the same beastly smell.

Mr. H. V. Jacob, Boggabri, writes :—I have seen this plant growing in large quantities in this district, and some ten years ago the late Mr. A. T. Brooke, who at that time owned Milchengorie Station, told me that he would never allow the plant to be cut up, as it was good feed for sheep. I have seen the sheep at times strip every particle of leaf off the bush, and apparently it did them no harm, although I must confess the sheep did not touch it till practically every other particle of food was consumed. In the 1902 drought the plant was fairly luxuriant, and the sheep cleaned every leaf off without any harm, while the plague of mice, which were at that time very thick, climbed the stalk of the plant and devoured the seed very readily. As the seed is enclosed in a very prickly pod, the cattle or other stock could not touch it, but the mice were able to gnaw the pod through, and thus get at the seed. The latter is small and black, and probably each pod contains a few hundred seeds. The castor-oil plant prefers the rich river flats, as a rule, although it often grows on the black soil near the river, but I have never seen it grow anywhere but fairly handy to the river, and it never seems to spread to any extent.

Mr. van der Merwe, then of the Hawkesbury Agricultural College, wrote to me that in the Orange Free State, South Africa, stock never seemed to touch it, but they must have gradually acquired a taste for it, for one year after the plants were nearly fully developed the cattle started eating them, and soon stripped off all the leaves, leaving only the stems and thorny seed heads, and even these which were not quite ripe were eaten. I distinctly remember a cow picking off one of these heads and chewing it, while I wondered how they managed to eat the prickly stuff. The following year the young plants were not given a chance, but were eaten as soon as they grew high enough to be fed off. It was known that the plant was poisonous; but we had begun to look upon it as not poisonous to cattle. It may be that the cattle were gradually immunised against the effects of the poison by small doses, until they could even eat the seeds with no bad effects, and that this may account for the fact that there were no fatalities.

Mr. Percy Murray, of Canowindra, writes:—I have seen cattle and sheep eating these pods greedily all day long, and when I have killed ration sheep the stomach has been full of seeds. Fowls are also very fond of them; also quail I have shot have nothing else in their crops but the castor seed. The cattle also eat the leaves, but sparingly; rabbits will eat all the bark when they are cut down. I am satisfied in my mind that the castor oil here is not the cause of deaths.

Another letter is from a well-known pastoralist in the Merriwa district, who desires that his name shall not be published. He writes: It is a common thing for cattle to eat the leaves of the castor oil plant, without any ill effect.

(2) *Evidence that stock eat the weed and that it poisons them*:—

Mr. P. R. Gordon, the late Chief Inspector of Stock, Queensland, reported that the stomachs of cattle that had died contained *Stramonium* plant, and analysis traced the poison to this plant. He adds: It may be remarked that in each instance the poisoning was confined to quiet milking cattle, and it will be found as a rule that mortality from poisonous plants is confined to quiet milkers, or their progeny. These pet animals will nibble at and eat plants that ordinary bush cattle will not touch, unless forced to do so from sheer starvation.

Mr. R. W. Peacock, Manager of Bathurst Experiment Farm, writes:—Last year a couple of our sheep died suddenly, and upon post-mortem examination their paunches were found full of this plant, and the lining membrane in a very inflamed condition. I haven't the slightest doubt but that death was caused by it.

(3) *Evidence that stock will not eat the plant.*—My own cow (and her successor) grazed in a paddock containing Thorn Apple plants. I eventually eradicated them entirely, but I never saw a cow (nor a horse) touch one of the plants, although I watched carefully for years. The old Benevolent Asylum grounds at Sydney (now resumed for the railway station) always had Thorn Apple plants growing amongst the grass, and the Asylum cows treated them with contempt. I watched these plants for years, and never knew them to be touched.

Many stock-owners have told me during the last twenty years that they have never known stock to eat this plant.

For twenty years I have systematically observed it near milking yards and stables in hundreds of places in country districts. In cases where I have mentioned to the farmer or dairyman that the plant might be poisonous, my remark has been invariably received with incredulity, as indeed the very presence of the weed would indicate.

V. K. Chesnut, an authority on the subject, in his "Thirty Poisonous Plants of the United States" (Farmers' Bulletin, U.S. Dept. Agric., No. 86, p. 30), says: "*One or two instances are recorded* [the italics are mine], in which cattle have been poisoned by eating the leaves of young plants which were present in grass hay." I look upon Prof. Chesnut's evidence as very important.

The evidence is more or less contradictory, but not irreconcilable. There is no doubt that some cattle and sheep eat the plant, and that most cattle refuse to touch it. The evidence that some cattle and sheep eat it without injurious effects is perfectly clear. The probable explanation is that given by Mr. van der Merwe, that animals eating it in small quantities to begin with, gradually become immune to its poisonous effects. A rigid modern series of experiments on the effects of this plant on stock is a desideratum, and I hope it can be carried out, for we have already too many "open verdicts" in regard to the deaths of stock. I think that my suggestion as to the licking up of seeds from the ground should be followed up, as this may be a clue to some reputed cases of poisoning.

The question of prolonged use of small doses and consequent immunity is so important as to require emphasis. I have known wharf labourers to chew such a quantity of tobacco as I think would either kill or seriously affect the health of an ordinary man.

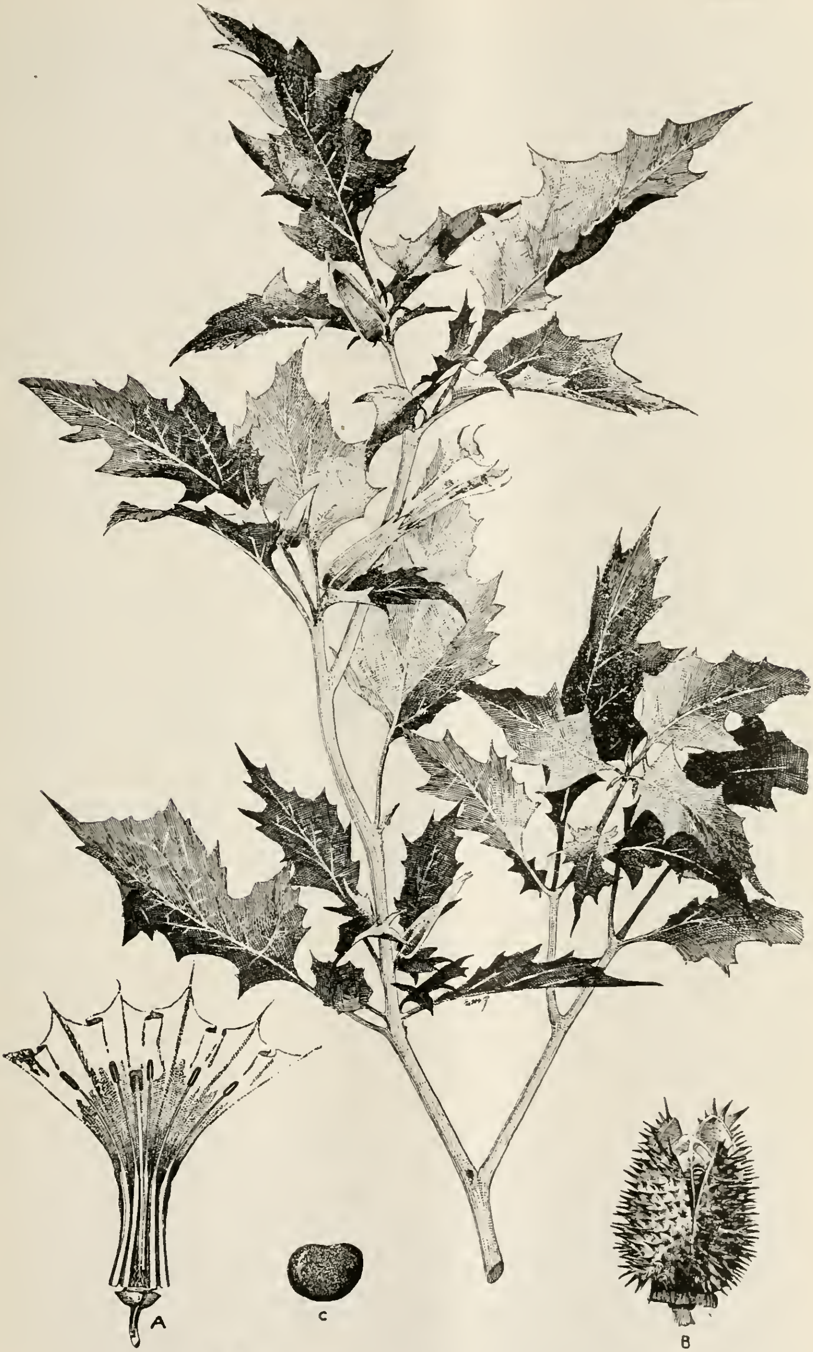
Dragendorff writes of *Datura Stramonium* :—"Leaves and seeds are used like *Atropa* (Deadly Nightshade) and *Hyoscyamus* (Henbane). . . . The seed contains Hyoscyamin, Atropin, Hyoscin, and Oxyatropin." The leaves contain the poisonous alkaloid Daturine of some chemists, but in much smaller proportion than the seeds. Even the latter possess only 1·10 per cent.

In cases in which stock have eaten the herb, I desire to know whether the toxic effect which has been recorded is *in any way owing to the very dangerous seeds* (in some cases the empty seed-pods have been eaten), or can be attributed to *foliage alone.* It is a disgrace to us, an important stock-owning country, that we have not yet settled this point. Personally I have raised it frequently enough.

Our best-known Asthma Remedy.—The leaves of Thorn Apple have been used in Europe for a century or more, for mixing with tobacco for smoking in cases of asthma, just as *Euphorbia pilulifera* is sometimes employed by people in Australia, who use it for a similar complaint. There is no doubt it often gives relief in this distressing complaint, and *Stramonium* cigars could be made locally just as they have been in Europe for close on fifty years. A rough article could be made for domestic use, or the leaves may be merely smouldered (with or without the aid of saltpetre) and the smoke inhaled. As regards the sale of these medicinal cigars, the revenue authorities offer no objection to them, provided they are made wholly of *Stramonium*, and are not so made up and advertised as to lead the public to believe that they are tobacco.

Poisonous nature of the seeds.—Following are extracts from an illustrated article I wrote for the *Sydney Mail* of 5th April, 1890 :—

> In the early part of the last month two men were camping near Jerilderie, when one of them gathered a quantity of a plant which he believed to be marshmallow, made a decoction of it, which was drunk cold by himself and his companion, with the result that they became so seriously ill that they had to be conveyed to the Jerilderie Hospital. Under the skilful treatment of Dr. A. C. Robinson the men fortunately recovered, and to that gentleman I am indebted for a sample of the plant, together with some notes on the case. The plant proves to be *Datura Stramonium* L., the well-known Thorn Apple of Europe, which, singularly, bears the name of "Wild Castor-oil Plant" in the district in which this unfortunate occurrence took place.



Thorn Apple or False Castor Oil Plant (*Datura Stramonium* L.)

A. A flower laid open to show the arrangement of the five stamens and pistil.
B. The fruit, showing the leathery pericarp, dehiscing by four valves.
C. A seed, which is somewhat kidney-shaped, and covered with large shallow pits.

WEEDS OF NEW SOUTH WALES.

Although, as far as I know, this is the first recorded instance of poisoning by Thorn Apple or Stramonium in the Australian colonies, cases are on record of poisoning by it in Europe; while in India Thorn Apple poisoning is a common occurrence, chiefly because it is administered from bad motives. The plant is common enough in all the colonies, chiefly near populated places, and its chief situations are near waste-heaps on which the rubbish of cultivated places has been thrown. It is also by no means a "new chum," and was probably introduced with garden seeds in the first instance.

I now quote Dr. Robinson's words in regard to his Jerilderie patients: "One of the men when brought here was comatose, the other was able to walk, but was excited, and suffering from delusions. I used emetics (zinc sulphate) and the stomach pump, after which I administered copious draughts of strong, hot coffee. In about twelve hours after taking the plant both were able to walk about, but the mind was deranged in the worst case for forty-eight hours. Both afterwards described the effects they felt to be a swelling of the tongue, thick speech, giddiness, and drowsiness. One man said his head and body seemed to swell as if it would burst through the skin." From what I can learn, the men were fortunate in escaping with their lives, and one man has particular cause for gratitude. I make no apology for detailing the symptoms and treatment, especially as the plant is spreading, and poisoning by it may have to be coped with it in the absence of a medical man.

Mr. C. Pierrepont Johnson records that accidents have frequently happened in Europe in swallowing an infusion of Thorn-apple herb in mistake for other preparations, as was the case at Jerilderie. Dr. Taylor records an instance in which a woman took two teacupfuls of the infusion, instead of senna tea. She was seized with giddiness, fainted, and became quite insensible in two hours, but the contents of the stomach being removed by the stomach pump, she eventually recovered.

The seeds are by far the most poisonous portion of the plant, and have caused death in numerous recorded cases. In India there were twenty-one deaths out of ninety-two cases. Sixteen grains killed a child in twenty-four hours, and, as the plant seeds freely, it is proper to put people on their guard.

The following amusing account of the effect of the Thorn Apple on some British soldiers in North America early in the seventeenth century is taken from Beverley's "History of Virginia": This, being an early plant, was gathered very young for a boiled salad by some of the soldiers sent thither to quell the rebellion of Bacon, and some of them ate plentifully of it, the effect of which was a very pleasant comedy, for they turned natural fools upon it for several days. One would blow a feather into the air, another would dart straws at it with great fury; another, stark naked, was seen sitting up in a corner, like a monkey, grinning and making mouths. A fourth would fondly kiss and paw his companions, and sneer in their faces with a countenance more antic than any on a Dutch doll. In this frantic condition they were confined, lest in their folly they should destroy themselves. A thousand simple tricks they played, but after eleven days returned to themselves again, not remembering anything that had passed.

From the following statement it will be seen that we have a far earlier record of poisoning by the seeds, but there are few records altogether; it is hardly possible that there are not more occurrences of this kind :—

Dr. Henry Early (*Australian Medical Journal*, vol. II, 1857, p. 241) describes seven cases of poisoning amongst children in the Immigrants' Home, Melbourne. The symptoms and signs were dilated pupils, a bright scarlet efflorescence, rapid pulse, much thirst, great excitement, maniacal paroxysms, startings, muttering, and occasional screaming, and catching at imaginary objects. Half a drachm of the seeds, which were fortunately immature, were obtained from the motions in one case. All recovered. Dr. P. T. Thane, of Yass, New South Wales, in 1899 (*Australian Medical Gazette*, p. 54) records three cases, two fatal. One was a girl of 5 at Yass. There were flushed face and rapid breathing, and later dilated pupils, loss of conjunctival reflex, tonic spasms of the muscles, a temperature of 104·4 degrees, and drowsiness without delirium. The seeds were vomited, passed in the motions, and found post-mortem in the stomach. Another case had occurred at Wagga three years before. The temperature rose to 104·6 degrees, and there were coma, clonic spasms, delirium, dilated pupils, and death in fifteen hours. A previous case at Yass, under Drs. English and Doolan, had had delirium, dilated pupils and a dry skin, but no rise in temperature; recovered.—(Dr. J. B. Cleland, in *Agric Gazette, Tas.*, xxii, 366, 1914.)

Where it is found.—It is now widely diffused in New South Wales, as is shown by the following information supplied by the Local Government Department in June, 1917, as to the municipalities and shires in which it has been declared to be noxious.

MUNICIPALITIES.

Aberdeen.
Armidale.
Bingara.
Botany.
Braidwood.
Coonamble.
Dubbo.
Kiama.
Picton.
Tenterfield.
Tumut.
Warren.
Windsor.
Young.

SHIRES.

Cessnock.
Cobbora.
Coreen.
Crookwell.
Hume.
Illabo.
Port Stephens.
Marthaguy.
Wingadee.

Wiser than we, Victoria has long since proclaimed it for the whole State.

Following are abstracts of some typical reports published by me in the *Gazette* many years ago :—

> Pretty well diffused; usually in good land, in the warmer, moister parts of the colony, but, like many other weeds, adapting itself more and more to circumstances. In the valley of the Hunter and other northern rivers it is very abundant.
>
> As a rule, grows in rich soils, especially cultivated land, in which it is spreading. No special attempt has been made to eradicate it. Locally called "Devil's Stinkweed" (Emu Plains).
>
> An utterly useless weed, with a most unpleasant smell. Mostly frequents the rich river flats and the roadsides, where it grows in countless numbers unchecked. Is kept in check on cultivated land by hoeing annually. (Pomona, Wellington.) Erroneously known here, and in many other parts of the colony, as "Castor Oil Plant," but not to be confused with *Ricinus communis*, the real Castor Oil Plant.
>
> Spreads rapidly in cultivated land and rich soils, while poor grass lands are almost free from it. No steps have been taken to eradicate it. (Wellington.)
>
> Found growing throughout the district. (Eglinton, Bathurst.)
>
> Mostly frequents cultivated land. Introduced with the packing of fruit-trees from the nurserymen. (Manilla.)
>
> Is rapidly spreading on cultivated lands, and utterly useless. It is locally known as "Oil Plant." (Singleton.)

How to deal with it.—It would be a good thing to make a raid on these plants year after year, wherever they work mischief; pulling or hoeing them out when the plant is in flower is best. They should never be allowed to seed. To carry out this advice effectively will be a matter of the greatest difficulty, since the weed is enormously developed in New South Wales; and, further, its commonest habitat is the banks of rivers and creeks—precisely where cattle have to go to drink.

The accompanying plate is reproduced from the *Agricultural Gazette*, June, 1891.

Popular Descriptions of Grasses.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE FESCUE GRASSES.

In the Fescue grasses there are several flowers to each flower-head, as in the Brome grasses, but they are much narrower and smaller in the former than in the latter. The outer sheath or glume of each flower in the Fescue grasses is also generally obtuse, and not sharp or two-pointed as in the Brome grasses.

The Fescue grasses are found growing naturally in the temperate and elevated portions of the globe. The useful kinds are much more numerous than the useless; nearly all varieties possess tussocky habits, one or two only having slightly creeping roots.

For the sake of convenience, the Fescue grasses can be divided into broad-leafed and fine-leafed species, and the principal ones in this State are :—

Broad-leafed—
  Tall Fescue or Giant Fescue (*Festuca arundinacea* Vill.).
  Meadow Fescue (*F. pratensis* Huds.).

Fine-leafed—
  Sheep's Fescue and its varieties (*F. ovina* Linn.).
  Hard Fescue (*F. duriuscula* Linn.).
  Red Fescue and Chewing's Fescue (*F. rubra* Linn.).
  Rat's Tail Fescue (*F. bromoides* Linn.).

Broad-leafed Varieties.

Tall or Giant Fescue (*Festuca arundinacea*).

This is a very strong-growing grass, with broad leaves and a deep fibrous root. It may be distinguished from the ordinary Meadow Fescue by its larger size, and the more pointed shape of its grain. The back of the seed is also rough, owing to the presence of minute spines, which are easily seen under an ordinary lens. The grass has a tussocky habit, with slightly creeping underground roots.

There is no doubt that in certain situations this is a very valuable grass. It can be strongly recommended for swampy, low-lying situations, or under irrigation. It is also very well adapted to cold localities, and at Glen Innes Experiment Farm it appears to endure the severe winter conditions better than any other grass. So far, Giant Fescue has not been grown extensively. Its tussocky habit and the coarse nature of the leaves is somewhat against it. Nevertheless, it is much appreciated by cattle, and a native grass, Hooker's Fescue, which is very similar to it in structure, is highly spoken of by cattle owners.

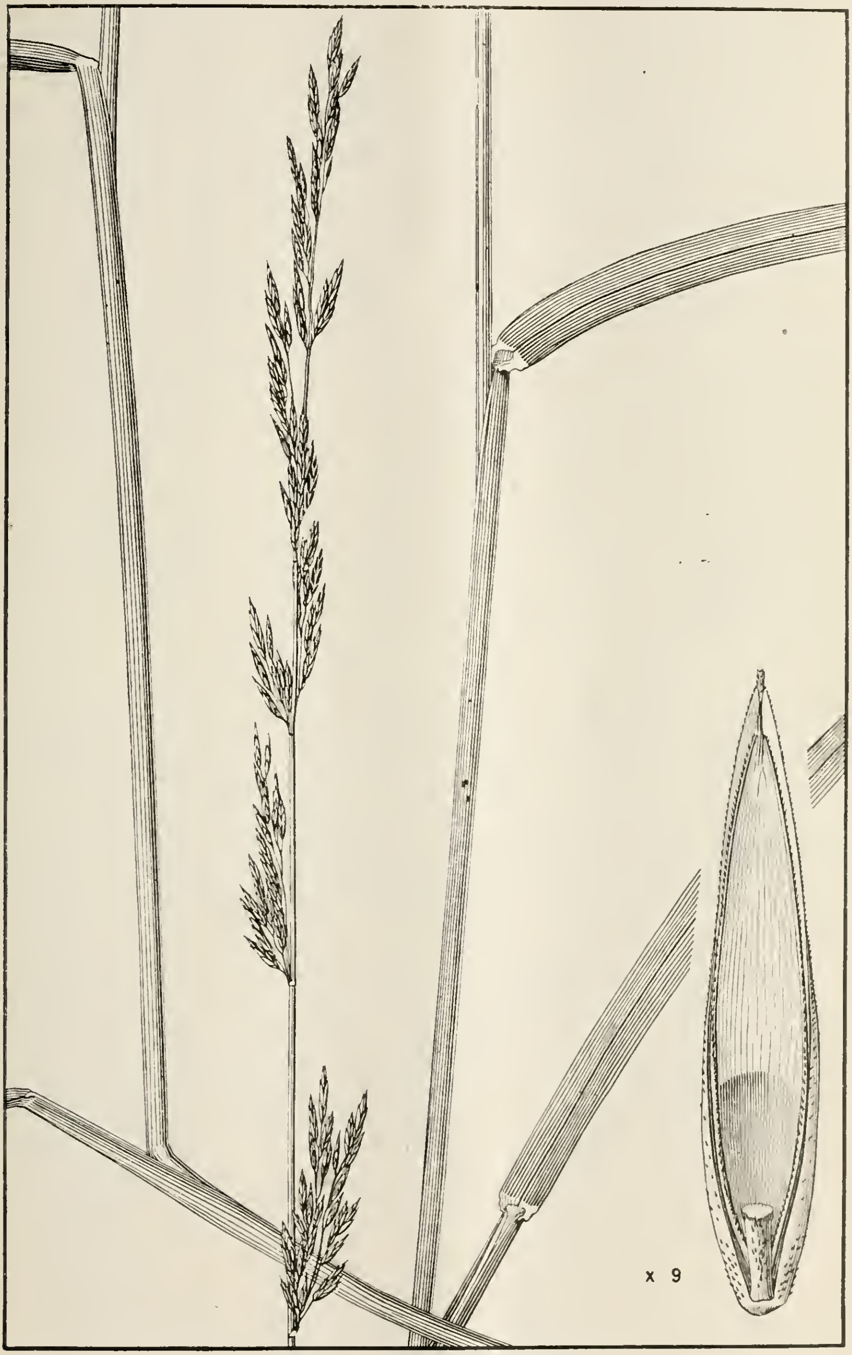


Fig. 1.—Tall or Giant Fescue (*Festuca arundinacea*).

Note the broad leaf and the pointed grain, and that this grass is larger than Meadow Fescue in all respects.

POPULAR DESCRIPTIONS OF GRASSES.

In the experience with Giant Fescue at Glen Innes and Bathurst Experiment Farms, Hawkesbury Agricultural College and the Murrumbidgee Irrigation Area, it has been shown that it is best sown in the autumn, preferably alone or with red clover, at the rate of 30 lb. of seed per acre. It fails to make vigorous growth the first year, and should only be lightly stocked for a time. After the first year, however, it becomes firmly established, standing dry conditions well, and producing heavy yields of fodder under moist conditions. It will endure a considerable amount of trampling, and there is rarely much dead flag attached to it.

The grass becomes ergotised in very moist situations, as happened in the very wet season 1916–17 at Glen Innes. Under such conditions care should be exercised to prevent it from being fed to stock, as ergot brings about abortion. The ergot forms on the flower and is transferred to the seed. By constant cutting and grazing it is not seen. All the flowering-stems of ergotised plants should be cut and burned, as the fungus will otherwise remain in the ground until the following year.

It is hardly likely that Giant Fescue will replace cocksfoot, rye and other good introduced grasses on ordinary soils, and it must only be considered practicable at present to grow it on poor swampy soils, unsuited to other grasses, or in very cold localities.

MEADOW FESCUE (*Festuca pratensis*).

This grass is sometimes known as *Festuca elatior*. *Festuca arundinacea* is also considered by some to be a form of *Festuca elatior*, but there is a vast difference as far as the habit is concerned between Meadow Fescue and Giant Fescue; for whereas the leaves of the latter are wide and the plant may attain a height of 6 feet, the leaves of Meadow Fescue are much narrower and the plant seldom grows more than 3 feet high. The panicle of flowers is also shorter and narrow, while there are also distinct differences in the grain.

Meadow Fescue is native to Great Britain and the greater part of Europe. It appears to thrive best, as far as this State is concerned, in elevated districts and on basaltic soils, such as may be found at Glen Innes. The leaves are soft and succulent. The growth is best in autumn and spring, but it keeps green during the winter months. It produces nutritious pasture and hay, and does well if combined with cocksfoot and rye grass.

(*To be continued.*)

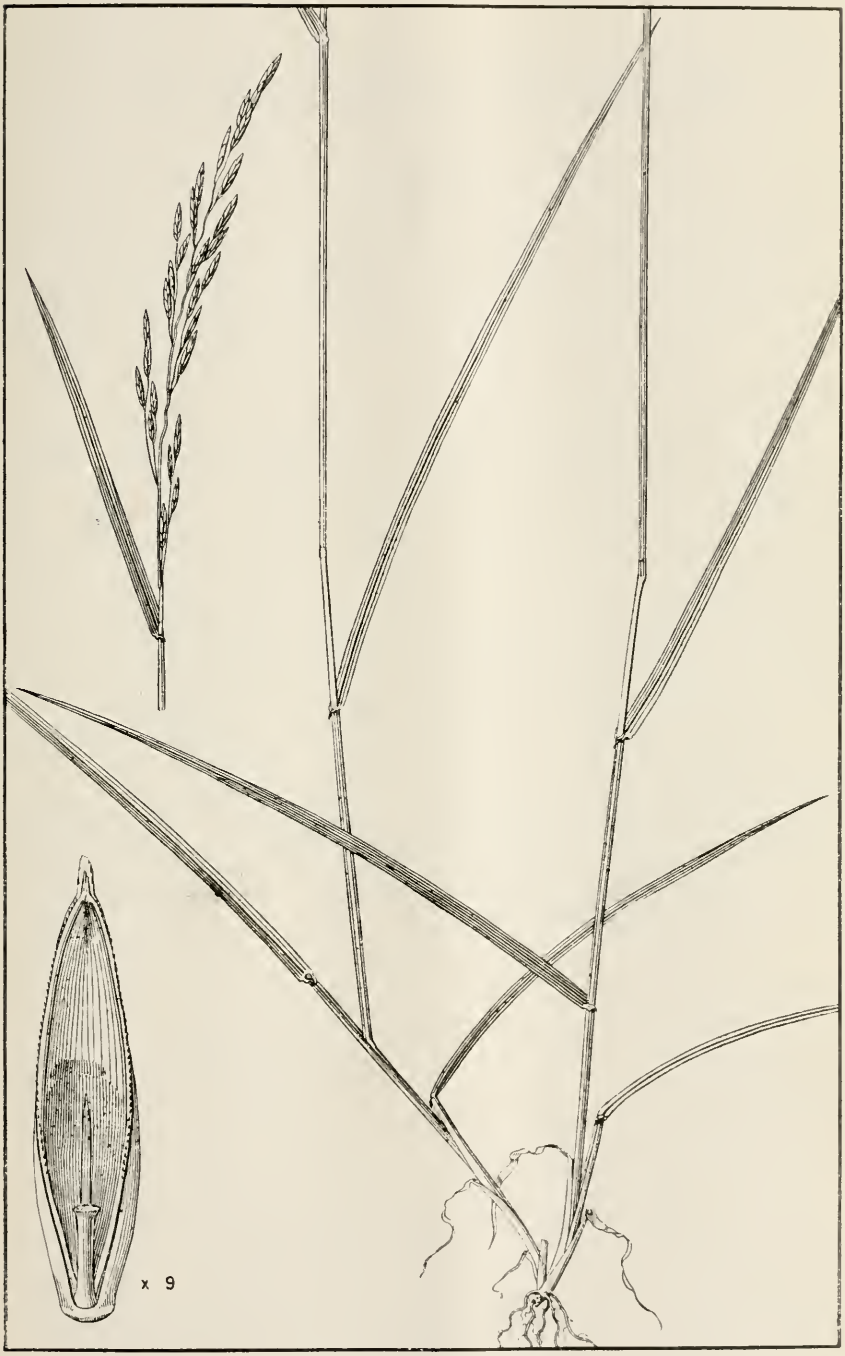


Fig. 2.—Meadow Fescue (*Festuca pratensis*).

Note the smallness of the leaves and seed compared with Giant Fescue.

POPULAR DESCRIPTIONS OF GRASSES.

Neutralising Acidity in Cream.

L. T. MacINNES, Acting Dairy Expert, and A. A. RAMSAY,
Assistant Chemist.

Some years ago the Department of Agriculture, through the Dairy Branch, instituted inquiries into the matter of neutralising acidity in cream prior to pasteurisation. The scope of this inquiry covered various neutralising agents such as carbonate of lime, quicklime, and bi-carbonate of soda, and the results of the inquiry have been published by the Department from time to time in the *Agricultural Gazette.*

Bi-carbonate of soda has generally been used up to the present by our butter manufacturers for this purpose, with very good results. Although limestone deposits are of large extent in this State, and burnt lime can be obtained at a very low cost, with one or two exceptions factory managers have not so far availed themselves of this substance, mainly because the method of using it has not been practically demonstrated, and detailed instructions issued. This did not cause any inconvenience while sodium bi-carbonate could be obtained in unrestricted quantities at a reasonable price. But one of the effects of the war has been to cut off supplies of this article; so much so, that there has arisen a fear that the amount coming forward would not suffice for the needs of the butter factories. Also the price rose so high that the cost of neutralising cream began to become a serious factor.

In view of this the Department determined to come to some finality in regard to finding a good substitute. Two essentials were necessary for this :—

1. The effect should be equally as good as the results obtained by means of sodium bi-carbonate.
2. The supply must, as far as possible, be independent of shipping restrictions, and be plentiful and cheap.

Going over the list of neutralising agents, commercial lime seemed to meet these requirements. Steps were taken to give it a practical test at once, and tabulate the data obtained for the use of those engaged in the manufacture of butter. This was sent out by circular on 22nd November to all interested.

Lime was being used by the Argyle Co-operative Dairy Company, Limited, Goulburn, for the purpose specified, and as there were large lime-kilns in the vicinity from which freshly burnt lime could be obtained, as well as that more or less slaked, that centre was selected for the carrying out of our practical researches. The manager and staff of the local butter factory facilitated the work in every way, and we are glad to take this opportunity of thanking them for their courtesy and co-operation.

Before entering upon the details of the work done, it is desirable to point out that at this factory the "Batch" or "Holding" system of pasteurising is installed, and the observations and deductions here recorded refer to neutralisation where this system is in use. But there is little doubt that they are equally applicable for use where other systems are worked.

Information received by the Dairy Branch in connection with factories that use the "Flash" pasteuriser, and have used lime in accordance with the instructions issued by the Department, proves that equally excellent results are obtainable as were obtained from the "Batch" system. The manager of the North Coast Co-operative Dairy Company, Limited, Byron Bay (where a "Flash" pasteuriser is installed), who is working on the information conveyed to him by the Department, writes:—

> From the date of our last letter we have used nothing but lime (as a neutralising agent), and think the results are good. It certainly takes a little more time to get ready than the bi-carbonate of soda in liquid form, but this is more than compensated by the facts that—
>
> 1. You can run longer without any loss of heat or speed, which you cannot do with the bi-carbonate, owing to the scum forming at the sides.
>
> 2. The thin skin which the lime forms inside comes off the sides as soon as you fill up to clean, and you have practically no scraping of the sides to do.

Butter made from cream so treated and containing no added boric acid graded 94 points.

At the Clarence River Pioneer Dairy Company, Limited, Ulmarra, Inspector W. A. Gibson, of the staff of the Dairy Branch, successfully demonstrated to the manager the use of lime as a neutralising agent in conjunction with the "Flash" pasteurising system. The manager has since used lime in preference to sodium bi-carbonate, and butter made from cream so treated has graded 94 points, which shows it is above the minimum for "choicest" quality.

The lime used at Goulburn was obtained a bag at a time, and stored in an old cream-can with a lid. Such a can holds about 100 lb. The lime was burnt locally, and appeared on the whole of good quality, although thin grey layers or veins could be observed in some lumps. The quality, however, varied, and in weighing off various small quantities of 3 or 4 lb. there were found from 2½ to 4 oz. of rock which would not slake. When this occurred an equivalent weight of quicklime was substituted for this inert matter.

In order to demonstrate the susceptibility of quicklime to atmospheric exposure a piece 1 lb. in weight was taken from the storage tin and exposed to the air for twenty-four hours, when, on reweighing, it was found to have increased by 2·2 per cent., and twenty-four hours later the increase amounted to 5·34 per cent., at which time the lime was breaking down and crumbling.

Lime of commerce can be divided into two classes :—

1. Soft burnt lime which slakes very easily, as is used by plasterers, &c.
2. Hard burnt lime which does not slake so readily.

The former would not keep its strength as long as the latter, which for this reason should have preference, as the cost price of both is the same.

Owing to this variation in the quality and strength of lime that will be used by different factories it is impossible to state definitely the exact percentage that would be required to reduce the acidity of 100 lb. of cream by 0·1 per cent. But the factory manager will not be far wrong if he allows ·6 or ·7 oz. of lime for this purpose. In a "Batch" pasteuriser of 600 gallons capacity it takes thirty to thirty-five minutes to raise the temperature from 100 degrees to 145 degrees Fahr., that is from the time when the adding of the lime is completed to when the temperature of the cream is at its maximum. If the acidity of the cream is ascertained at this point it should be found to be reduced to about 0·03 per cent. higher than would be shown if a further acidity test was taken twelve hours later, demonstrating that the neutralising action was not completed within the first mentioned period.

In the following table a statement is given of the results of the various experiments made :—

	Cream used.	Observed acidity.	Lime added.	Acidity of cream after neutralising.	Results obtained.
	gallons.	per cent.	oz.	per cent.	
No. 1 ...	640	0·497	93	0·296	10 gallons cream reduced 0·1 per cent. acidity, by ·723 oz. lime.
No. 2	260	·543			10 gallons cream reduced 0·1 per cent. acidity, by ·684 oz. lime.
	190	·450			
	450	·504	89	0·215	
No. 3 ...	310	·420	32·9	0·240	10 gallons cream reduced 0·1 per cent. acidity, by ·589 oz. lime.
No. 4	400	·41	48·3		10 gallons cream reduced 0·1 per cent. acidity, by ·71 oz. lime.
	200	·40	23·9		
	600	·407	72·2	0·240	

The above results indicate that from ·589 to ·723 oz. of lime, (according to its nature and quality), were necessary to reduce the acidity of 100 lb. of cream by 0·1 per cent.

A Summary.

The data collected can be summarised as follows :—

1. Limestone varies in quality.
2. Unslaked lime varies in strength.
3. Unslaked lime, by exposure to the atmosphere, quickly absorbs moisture and becomes weakened or slaked.

4. It follows from the foregoing that the quantity of lime required to reduce a given volume of cream to a standard acidity will vary.

5. As a basis for calculation, it can be taken that ·6 oz. of unslaked lime will reduce 100 lb. of cream by 0·1 per cent. acidity.

6. If the lime is weak it may take ·7 or ·75 (¾) oz.; if of extra good quality ·5 (½) oz. to 100 lb. of cream would be required to reduce acidity by 0·1 per cent.

7. It is preferable to buy *hard burnt* lime for the purpose, as it is less affected by exposure to air. Soft burnt unslaked lime (builders' lime) is very susceptible to the least exposure. The price for hard burnt lime is usually no greater than that charged for soft burnt.

8. When the atmosphere is charged with humidity, as is usual on our coastal areas, the adverse effect on even slightly exposed lime is rapid.

9. It is, therefore, necessary to keep stocks of lime in air-tight vessels. For small quantities old cream cans may be used; for large quantities 200-gallon tanks are suggested. For reserve stocks it would be advisable to cover the top surface (say the neck of a can or round the man-hole of a tank) with slaked lime (powdered) to a depth of six inches. The powdered lime absorbs any moisture that may penetrate through the cover.

10. Hard burnt lime would keep, under ordinary conditions and partially exposed to atmosphere, say from two to four weeks; soft burnt lime from one to two weeks, but kept in air-tight vessels, as described in No. 9, the former should keep its strength for months.

11. To ascertain the amount of lime required, find out the number of pounds of cream to be neutralised and the acidity of same; for example, 600 gallons of cream (6,000 lb.), with acidity test of 0·5 per cent would require say, ·6 oz. of lime multiplied by 60 (or 60 times 100 lb. of cream), multiplied by 3 (amount of acidity to be reduced by)—presuming it is desired to have a final acidity test of 0·2 per cent. This equals 6¾ lb. of lime.

12. In preparing lime for use it requires breaking down by water at the rate of 1 gallon of water to 1 lb. of lime.

13. Place, say, 3 or 4 lb. unslaked lime in a bucket or other vessel, pour over it about half a gallon of hot water (160-183 degrees Fahr.); slaking will immediately commence, and water will boil up violently. Just sufficient water should be used to make a thick mass that can be stirred about. If cold water is added in the first instance, the slaking is not so sure, nor so rapidly accomplished. When slaking is complete, add further hot water up to 3 or 4 gallons. If there are now found present any rock or stones, that is, refuse, these must be abstracted, and an equal weight of fresh lime substituted. Let the mixture stand for ten or fifteen minutes, then stir well and pour carefully into another vessel. Should any sand be present in the lime, this will be left at the bottom of the first vessel. The weight of this sand should be noted, and its equivalent in fresh lime added.

14. These investigations were carried out when a "Batch" pasteurising plant was used, the vat being of 600-gallon capacity. Cream was pumped from the receiving vat to the pasteurising vat, until reaching to within about 4 inches of the top of the coils. The volume of this was ascertained, as was also the acidity. To obtain the volume a measuring stick was used. A particular part of the vat, preferably that farthest from the outflow tap, was always taken for this purpose. The stick should be marked to show hundreds of gallons. This may be done by measuring a known volume of water into the vat, and marking this quantity on the stick at the part that is level with the top of the vat when the end just touches the surface of the water. The hundred-gallon marks could be further subdivided if necessary.

It was found in practice that in a vat of this description, 400 gallons (two-thirds of capacity) could be pumped up, leaving one-third to be added later.

15. The coils in the "Batch" vat should now be set going, in order to mix and heat the cream. When thoroughly mixed, take a sample for acidity. Having obtained this, calculate the amount of lime required to reduce it to 0·2 per cent. When the cream is heated to 90 degrees or 100 degrees Fahr., add the lime solution, at the same time being careful not to pour it in at the one spot. The revolving coils will soon mix it through the cream. The amount of lime required to neutralise the balance of the cream intended for the vat could now be found, and while this cream is being pumped up, the lime could be added by degrees. A point should be made, however, to have it all in before coils are covered, as, if added after that, it will be harder to get it mixed in with the body of the cream.

It is found that if the lime is added to warm cream (90 degrees and over) the latter does not thicken or become viscous—if added to cold cream, this occurs.

If the acidity of the cream is taken when it is cooled down, say one and a half or two hours after adding lime, it should be found to have been reduced to 0·23 or 0·24 per cent. Another test, taken, say, ten or twelve hours later, will show a further reduction in the acidity of about 0·03 per cent., showing that the neutralising action is still going on. Lime, in this respect, differs from bi-carbonate of soda. With the former the neutralising process is slow, and proceeds over at least twelve hours, while with the latter the reaction is more rapid, and is completed inside an hour.

16. These deductions and conclusions are not complete, and it is intended, as soon as possible, to continue the investigation with the "Flash" system of pasteurising. They have gone sufficiently far however, to warrant them being published in order that managers may be able to avail themselves of lime as a substitute for bi-carbonate of soda in factories where the "Batch" system of pasteurisation is installed. Further, it is thought that the information would also be applicable, and found of value where the "Flash" system is used.

Thousand-lb. Cows.

[Continued from Vol. XXVIII, page 890.]

L. T. MacINNES, Acting Dairy Expert.

A famous philosopher of ancient Greece has said—"Whatever is good is also beautiful in regard to purposes for which it is well adapted, and whatever is bad is the reverse of beautiful in regard to purposes for which it is ill adapted."

This is applicable to our dairy stock. The best cow in the milking herd may not be the most beautiful in appearance. The dairy farmer rightly judges her to be his best cow which—

(1) yields the most at the bucket, and

(2) is capable of transmitting such milk and butter-producing qualities to her offspring.

The same applies to the sire. His value depends on his ability to stamp high butter-producing characteristics on his descendants.

By the records here published it is seen that No. 1 condition for a good cow has been complied with; in many cases it remains to be seen whether No. 2 can be fulfilled. In doing this the pure-bred cow has all the advantages of heredity over the animal that cannot show a pedigree. This also applies to the male. The pure-bred is more prepotent than the grade bull.

As far as the two cows which are the subject of this article are concerned, they have proved themselves productive above the ordinary; they also show breeding and constitution. As regards the most important qualification, the ability to transmit their milk and butter-fat producing qualities to their descendants, in Brighton Vanilla II we have no completed record of any of her daughters—one, Brighton Vanilla IV, A.J.H.B., Vol. VI, has just begun her first testing period at 2 years of age. Commencing in October, she has in the intervening 63 days to date yielded 1,477 lb. milk, 86 lb. butter. Her completed record of 273 days is looked for with great interest.

Melba XI (Vol. IV, M.S.H.B. of N.S.W.), daughter of Melba VII, testing this year as a two-year-old, in 273 days put up a record of 6,492 lb. milk, 341 lb. butter (283 lb. fat), with an average test of 4·5 per cent. This record was completed in November, 1917. In the middle of her test she was brought by rail to Sydney, a long and tedious journey, and exhibited at the Royal Agricultural Society's Exhibition (April, 1917). As in the case of her dam, this could not but have an adverse effect on her yield. It is worthy of note that at this Show she gained first prize in her class (2 years and under 3 in milk), and reserve champion. Turning to the record of the ancestors of Melba VII, her sire, Emblem of Darbalara, won First and Champion prizes at the

Royal Agricultural Society's Show, Sydney, for seven years, 1910 to 1916; also prize for bull and progeny, 1913, 1915, 1916 for his own class, and in 1913 in all classes. His dam, Madame of Bolaro, 406 M.S.H.B. (who was also g dam of the dam of Melba VII), when 16 years of age, yielded, under official test, 9,163 lb. milk, 419 lb. butter (348 lb. fat), in 365 days (7,763 lb. milk, 350 lb. butter, 290½ lb. fat, in first 273 days). Melba IV of Darbalara, 1576 M.S.H.B., the dam of Melba VII, under official test, produced 7,958 lb. milk, 349 lb. butter (290 lb. fat), in 273 days. At the commencement of this test she suffered from milk fever. In the test which she is undergoing now, commencing from 23rd August to November inclusive, she has yielded 6,408 lb. milk, 291 lb. butter (241 lb. butter-fat) in 123 days. She also won First and Championship honours at the Royal Agricultural Society's Show in Sydney in 1912. It will be thus seen that heredity is very strong in Melba VII; not only has she descended from stock showing high milk and butter-fat producing qualities, sound constitution and good type, but she has demonstrated that she is able to pass these qualifications on to her offspring.

There is just about to enter, as a two-year-old, on her first official test, another daughter of this fine cow, from whom her owners expect great things, and they hope that in time she will eclipse her dam's performance.

The performances put up by Brighton Vanilla II, Melba VII, and her daughter Melba XI in the show ring, draw attention once more to the advisability of judging dairy stock on a system whereby their production records would be taken into consideration, in addition to points being given for type and constitution. Such a system was drawn up by the writer for the premier dairy stock show on the North Coast (Bangalow A., I. and H. Society), and was successfully put into operation some three years ago. In this, females over 2 years had to show their own production records, young heifers those of their dams, aged bulls the records of three of their daughters, young bulls the records of their dams and, if possible, that of their sire's dam.

In other countries when cows are putting up high records they are milked out three and four times a day—a big advantage when large quantities of milk are carried; but in the case of both the Jersey Brighton Vanilla I and the Milking Shorthorn Melba VII, the milking was only done twice a day morning and evening.

In America, from whence most of the advanced testing records have come so far, the object in view is not so much the general uplifting of the dairy herds, as the endeavour to win the blue ribbon of the breed. In this way an interesting competition has sprung up amongst many wealthy owners, who carry on stud breeding more as a hobby than for profit.

In this country the position is not the same; our Government and our breeders are endeavouring to improve the average breed of dairy cattle in the State and to increase the average yield of milk and butter. Any competitions are entered upon primarily with this object in view. In general, dairy stock breeders run their studs as a business; they cannot afford luxurious hobbies unless they more than pay their way. Since the testing of pure-bred cattle commenced, however, breeders in this State have, on account of the higher prices for progeny of such stock, turned more attention to obtaining high production figures, with the result as here recorded.

The Government is aiding and encouraging the testing, recognising it as a means of stimulating the breeding of more productive strains, and at the same time giving the opportunity of tabulating a list of those pure bred cattle that may be used by those engaged in the dairying industry for the building up of their herds.

Records in Other Countries.

In connection with the records already established here, and which it is hoped will often be supplemented in years to come, it is interesting to make comparison with those put up in other countries.

In Australia, Victoria is the only other State to show a record of over 1,000 lb. of commercial butter. There a Red Poll cow, named Muria, owned by the Government and under official test, produced 14,972 lb. of milk, 885 lb. of butter-fat, with an average test of 5·9, equal to 1,008 lb. of butter by computation on an 86 per cent. butter-fat basis. This record was put up in 1914–15 (twelve months), at the Government Research Farm, Werribee.

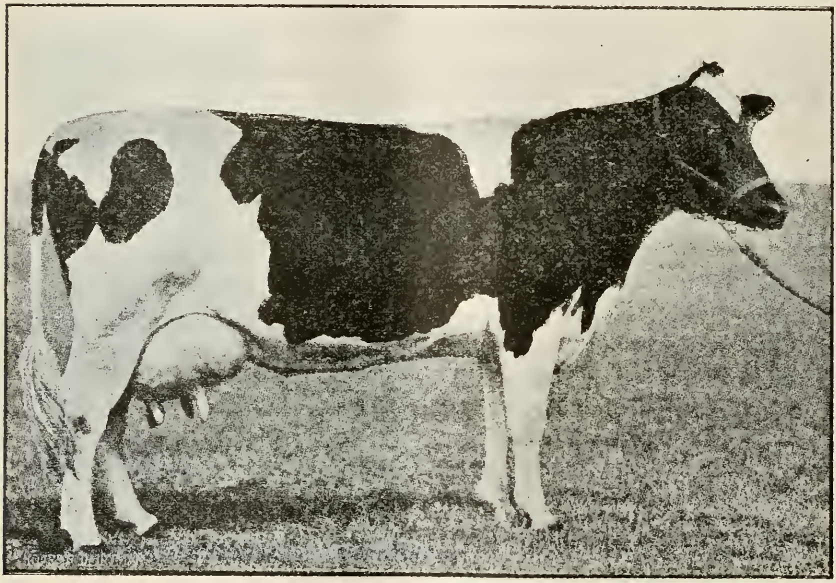
The New Zealand dairy division of the Department of Agriculture reports that the yield of the Friesland cow Talma Joanna Lyons, owned by Mr. W. Barton, of Featherston, stands as a record in the Dominion. She yielded 21,440 lb. milk, producing 730 lb. butter-fat. When under test as a three-year-old, she produced 17,406 lb. milk, containing 560 lb. butter-fat. Calving again in six weeks, she produced the record milk yield given above, and the best butter yield in her class. She was imported from Wisconsin, U.S.A., and is by Greenwood Joanna Lyons, who sired in America three other daughters with yearly records.

In America, cows giving similar high yields are more frequently met with. The Friesian cow Lutscke Vale Cornucopia, No. 505, is accredited with yielding 31,239 lb. of milk and nearly 1,000 lb. of butter. She has beaten Tilly Alcartra by 787 lb. of milk, and Creamelle Vale by 1,648 lb., and the record of the famous Colantha 4th's Johanna is surpassed by no less than 3,807 lb. of milk.

The detailed figures of her record are interesting. Her best day's milk was 119·7 lb.; for 180 days she averaged over 100 lb. milk a day. Her record for the months of the year is as follows:—May, 18 days, 1,884·0 lb.; June, 3361·7 lb.; July, 3397·9 lb.; August, 3202·6 lb.; September, 2787·7 lb.; October, 2633·3 lb.; November, 24 6·9 lb.; December, 2303·3 lb.; January, 2151·9 lb.; February, 1973·1 lb.; March, 2088·5 lb.; April, 2177·2 lb.; May, 12 days, 861·1 lb. Total, 31,239·2 lb.

The 14th day of May, the fourth day after calving, she gave 86·4 lb. of milk. On the last day of her test, 365 days later, she gave 71·5 lb., which shows great persistency indeed. She was milked four times a day during the entire year, and never missed a single feed. The summer of 1915 was a very hot, dry one for Washington, with very little pasture, and the winter one of the longest and coldest known in that country for the last thirty-five years. Though the weather was against her for almost all of the 365 days, she overcame all disadvantages.

The Holstein Friesian cow Finderne Pride Johanna Rue, 121083, produced in 365 consecutive days 28,404 lb. of milk, 1,176 lb. of butter-fat, thus beating all previous records for butter-fat production. She freshened at the age of 5 years 4 months. Her sire is Johanna Rue 3rd's Lad, 26939; her dam, Jondine Pride, 60247. She was bred by Mr. Bernard Meyer, New Jersey, U.S.A., and she is now owned by the Somerset Holstein Breeders' Company, New Jersey, U.S.A.



Holstein Friesian Cow Finderne Pride Johanna Rue, 121083, which produced in 365 consecutive days 28,404 lb. milk, 1,176 lb. of butter-fat, thus beating all previous records for butter-fat production.

The test was made under the supervision of the New Jersey Agricultural College. Near the close of her eleventh month in this test, she was placed under the closest scrutiny; every milking was watched, weighed, sampled, and tested for the last thirty days, and in that time she produced 2,437 lb. milk, 117·6 lb. butter-fat. During the best seven days, beginning 258 days after freshening, the production was 602 lb. milk, 28·8 lb. butter-fat. Thus she produced in seven days at the close of her year's test, nearly as much fat as she did when at her best.

The Guernsey cow Murne Cowan has recorded to her credit 1,098 lb. butter-fat in a 365-day period, while another Guernsey, May Rilma, yielded 1,073 lb. butter-fat during a similar period. Yeksa Sunbeam, 1549, also a Guernsey, when 9 years old gave 14,921 lb. milk, producing 857 lb. butter-fat.

The two-year-old Guernsey heifer, Cherry of Edgewater, holds the exceptionally good American record of 18,454 lb. of milk, 733 lb. of butter, in 365 days. Her dam, Rosa of Cherrydale, when 2½ years old, gave 10,273 lb. milk, 556 lb. butter-fat; and on being re-tested after the performance of her daughter had become available, she put up a record of 12,114 lb. of milk, 682 lb. butter-fat. In addition to being a high producer herself, she has demonstrated that this quality is hereditary in as far as her daughter is concerned.

The American cow Jacoba Irene held the Jersey record for five years—1908 to 1913—954 lb. butter-fat (1,121 lb. butter). She was then displaced from the position by Eminent's Bess, with 18,783 lb. milk, with an average test of 5·12 per cent., yielding 963 lb. butter-fat, equal to 1,132 lb. butter.

This milk record has since been broken by Passport, 219742, who, in her seventh year, produced in her 365-days' trial, 19,744 lb. milk, 985 lb. butter.

Sophie's Adora, 299594, now holds Championship honours, as a four-year-old, with 15,852 lb. milk, 888 lb. butter-fat, equal to 1,045 lb. butter on an 85 per cent. basis.

Other Jerseys exceeding the 1,000 lb. butter (85 per cent. fat) standard are—

Name.	Milk lb.	Butter-fat lb.	Butter lb.
Olympia's Fern, 252060	16,147	937	1,103
Sophia 19th of Hood Farm, 189748 ...	17,557	999	1,175
Spernsfield Owl's Eva, 193934 ...	16,457	993	1,168

One of the first records of the productiveness of the Ayrshire is that of Rena Myrtle, tested by the Vermont Experiment Station, with 12,172 lb. milk, 546 lb. butter.

This record held for a number of years, until the cow Keepsake just exceeded it with 12,365 lb. milk, 548 lb. butter. This was followed by the returns of Rena Ross, showing 15,072 lb. milk, 751 lb. butter; which in turn is beaten by the record put up by Netherhall Brownie 9th, 23985, tested under the supervision of the Washington State Agricultural College. This official test shows that she yielded 18,110 lb. milk, 821 lb. butter-fat, or 958 lb. butter (86 per cent. butter-fat). This has since been bettered by the production placed to the credit of Auchinbrain Brown Kate, 27943, of 23,022 lb. milk, 927 lb. butter-fat, or 1,079 lb. butter (86 per cent. fat).

No foreign official records covering long periods are available for the Milking Shorthorns.

In all the foregoing records, wherever possible, the yield is shown in pounds of butter-fat, as this is the only international basis of comparison. When computing pounds of commercial butter, the amount added on to the butter-fat varies in different countries.

In New South Wales the basis is 83 per cent. fat, which by analyses has been found to be the fat content of our butter in the great majority of cases. In the tables used by butter manufacturers, whereby to pay cream suppliers, allowance has been made for losses that occur in the process of separating cream from milk by mechanical means, for loss of fat in the buttermilk in churning, and for loss entailed in packing butter for market. These losses are not taken into consideration in the tables used by the United Pure-bred Cattle Breeders' Association of New South Wales, as the object of such tables is to estimate, as nearly as possible, the actual value, in lb. of butter, of the milk as it comes from the cow.

In Victoria the calculations are based on an 86 per cent. butter-fat basis, whilst in the United States of America the basis varies from 85 to 83 per cent., and in Canada the computations are made on an 80 per cent. butter-fat basis. In New Zealand the yields are officially recorded in lb. of butter-fat.

It will thus be seen that in quoting the yield of a cow in pounds of commercial butter, no world-wide comparison can be made—such can only be obtained by recording the pounds of butter-fat.

In order to meet this, the United Breeders' Association of this State have made it a rule that all records should show both butter-fat and commercial butter yields—but this does not altogether remove the causes of misunderstanding, especially when it comes to advertising what are termed the thousand-lb. butter cows.

In view of this, it would appear advisable that the basis of comparison should be butter-fat in place of commercial butter; and instead of speaking or writing about a thousand-lb. butter production, it would be better, in future, to refer to all yields in terms of butter-fat.

POISONOUS PROPERTIES OF *Senecio Jacobæa.*

IN the course of an article on groundsel (*Senecio vulgaris*) in the *Agricultural Gazette*, April, 1917, reference was made to an allied plant, *Senecio Jacobæa*, which it was said is eaten by sheep in England without injury, although in New Zealand it is reported as producing cirrhosis of the liver in stock. Reference is made to this plant, *S. Jacobæa*, in the *Journal of the Board of Agriculture* for July, the statement being made there that it is not generally recognised that this common British ragwort is poisonous to cattle, but from cases recently investigated in the Veterinary Laboratory of the Board of Agriculture, it would appear probable that the weed is harmful. Under natural conditions the poisoning is a slow process; but with continuous doses the amount of poison which becomes available is sufficient in time to cause very serious symptoms, which often end in death. In one case quoted, visible symptoms of poisoning were not observed until forty-four days after feeding on ragwort commenced. As to sheep, there seems reason to think that the flowering season is the time of greatest danger.

Official Milk and Butter Records.

L. T. MACINNES, Acting Dairy Expert.

THE following milk and butter records of pure-bred dairy cattle tested under the United Pure-bred Cattle Breeders' Association of New South Wales' testing scheme, by the officials of the Department of Agriculture, are now made available for publication.

Mr. J. T. Young's Herd.—The fine cow Empress, it will be noted, has again put up a splendid record for a 365-day period. Her milk yield compares favourably with those of the two cows that have each recently established a record for 1,000 lb. of butter. The quantities of milk and butter given by the three cows are as follows :—

Melba VII—17,364 lb. milk, 1,021 lb. butter, equal to an average test of 5 per cent.

Brighton Vanilla II—18,197 lb. milk, 1,012 lb. butter, equal to an average test of 4·75 per cent.

Empress—17,923 lb. milk, 894 lb. butter, equal to an average test of 4·2 per cent.

It is interesting to note that Empress' daughter, Empress II, as a 3-year-old, has also put up a good record, as shown in the attached list.

The Scottish-Australian Investment Co.'s Herd.—The records of eight cows are included in this list, the most striking being that of Melba VII, particulars of which were published last month. Melba VIII is seen to be following in the footsteps of her more famous namesake. For a 3-year-old, 13,342 lb. of milk, yielding 617 lb. butter, is a most creditable performance.

Mr. C. R. G. MacDonald's Herd.—These further two records from this well-known herd add to the reputation already established for production. The details of the performance of Brighton Vanilla II were also published in the December issue. Brighton Coomassie II's record, though creditable in itself, does not appear to such advantage as is its due, on account of being published in conjunction with that of her herd-mate.

Mr. S. Hordern's Herd.—Records of two more of the members of this herd are shown, that of Brown May being above the average.

Mr. E. P. Perry's Herd.—The reputation of the Guernsey as a producing breed is upheld by Tulip des Pres (imp.), whose performance of 9,750 lb. of milk, 582 lb. butter, in 273 days is a very good one indeed.

Mr. James Pritchard's Herd.—Jean of Kabibinokka gives promise of developing into a most productive animal. Her record of 9,723 lb. of milk, with an average test of 4·6 per cent., producing 530 lb. of butter, in 273 days, put up at such an early age, shows that she is far above the average. It will be interesting to see what records this Ayrshire will establish for her breed in the next few years.

Mr. J. T. Young's Milking Shorthorn Herd at Bangalow.

Name of Cow.	Age at beginning of Test.	Date of last Calving.	Total.		Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Milk.		Butter.	Milk.	
	yrs.	1916.	lb.	lb.	%	lb.	lb.	
Empress II	3	7 May ...	481	10,109	4·0	·97	17	365
Empress	9	12 July ...	894	17,923	4·2	1·27	24	,,
Crimson	9	17 Dec. ...	307	6,609	3·9	·63	13½	273

The cows were fed on pasture only, with the exception of Empress, who received in addition, during August, September, and October, a little bran and sweet potatoes daily; November, pasture only; December, a little bran daily.

Scottish Australian Investment Co.'s Milking Shorthorn Herd at Darbalara.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.		Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Milk.		Butter.	Milk.	
	yrs.	1916.	lb.	lb.	%	lb.	lb.	
Virginia IV, vol. iv ...	4	1 July ...	557	11,536	4·1	·64	11	365
Melba VIII, vol. iv ...	3	11 June ...	617	13,342	3·9	·87	16½	,,
Bloomer, 1295	8	4 Sept. ...	621	11,819	4·4	·28	5	,,
Shamrock XIV, vol. iv ...	4	11 Aug. ...	629	12,441	4·3	1·29	23	,,
Melba VII, vol. iv ...	6	25 Oct. ...	1,021	17,364	5·0	2·00	34	,,
		1917.						
Camellia XIV, vol. iv ...	2	10 Jan. ...	286	6,042	4·0	·95	20½	273
Minnie XI, vol. iv ...	3	13 Feb. ...	346	6,648	4·3	·99	22	,,
Champion XII, vol. iv ...	2	17 ,, ...	261	5,458	4·0	·61	15½	,,

The whole of the cows were fed on natural pasture only, with the exception of Melba VII, who received in addition, during November, 1916, 8 lb. bran and 8 lb. oaten chaff daily; from December, 1916, to February, 1917, 10 lb. crushed oats, 8 lb. bran, and green corn daily; in March and April, 5 lb. bran, 5 lb. crushed oats, 3 lb. boiled corn, and 3 lb. oaten chaff daily; May, June, and July, 3 lb. pollard, 8 lb. lucerne chaff, 4 lb. bran, 4 lb. crushed oats daily; August, 3 lb. pollard, 8 lb. oaten chaff, 4 lb. bran, 4 lb. crushed oats, 2 lb. oilcake daily; September and October, 2 lb. pollard, 3 lb. bran, 3 lb. crushed oats, 1½ lb. oilcake, and 5 lb. oaten chaff daily.

Mr. Jas. Pritchard's Ayrshire Herd, at Numba, Shoalhaven River.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.		Average Test.	Yield on last day of Test.		No. of days on Test.
			Milk.	Butter		Butter.	Milk.	
	y. m.	1916.	lb.	lb.	%	lb.	lb.	
Jean of Kabibinokka, 3038	2 9	26 May ...	530	9,723	4·6	1·02	13½	273

Fed on pasture only.

Mr. C. R. G. Macdonald's Jersey Herd, at Ingleburn.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.		Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Milk.		Butter.	Milk.	
	y. m.	1916.	lb.	lb.	%	lb.	lb.	
Brighton Coomassie II, vol. vi.	1 10	14 Sept. ...	571	8,655	5·6	1·53	20	365
Brighton Vanilla II, 3078	5 3	31 Oct. ..	1,012	18,197	4·7	2·36	38½	,,

In addition to pasture feed each cow received daily 2 lb. each of bran, pollard, maizemeal, linseed oilmeal, and 4 lb. lucerne chaff.

Mr. S. Hordern's Jersey Herd at "Retford Park," Bowral.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.		Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Milk.		Butter.	Milk.	
	yrs.	1916.	lb.	lb.	%	lb.	lb.	
Brown May (imp.), vol. v..	5	3 Decr. ...	574	9,411	5·1	1·81	29	273
Retford Queen, 3068 ...	5	16 Nov. ...	377	6,187	5·1	·93	13½	,,

In addition to pasture feed each cow received during December, 1916, 8 lb. oaten chaff and 8 lb. bran; January, 1917, 8 lb. bran, 10 lb. oaten chaff daily; February, pasture only; March, 6 lb. lucerne chaff and 8 lb. bran daily; April, 8 lb. bran, 10 lb. oaten chaff daily; May and June, 6 lb. bran, 6 lb. oaten chaff daily; July, 6 lb. bran, 2 lb. crushed oats, 2 lb. maizemeal daily; August, 8 lb. bran and 8 lb. lucerne chaff daily.

Mr. E. P. Perry's Guernsey Herd at "Nundorah," Parkville.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Totals.		Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Milk.		Butter.	Milk.	
	yrs.	1916.	lb.	lb.	%	lb.	lb.	
Tulip des Pres (imp.), 193.	4	7 Dec. ...	582	9,750	5·0	1·55	24	273

In addition to pasture feed this cow received during December, 1916, 6 lb. bran, 4 lb. molasses, and a little hay daily; January, 1917, 6 lb. bran, 2 lb. molasses, 1 lb. each of cowpeas and corn boiled daily; February, 8 lb. bran, 3 lb. molasses, 2 lb. boiled peas; March, 4 lb. molasses, 9 lb. bran, and a little hay daily; April and May, 10 lb. bran, 4 lb. molasses, and 5 lb. oaten chaff daily; June, 6 lb. bran, 1 lb. oats, and 2 lb. boiled corn daily; July and August, 4 lb. molasses, 6 lb. bran daily.

Analysis of Soils, Manures, Fodders, &c.

As it is found that the privilege conceded to farmers of having their products analysed by the Department is continually sought for by men of business and others not entitled to this concession, it is hereby notified that analyses for persons other than farmers can only be undertaken under exceptional conditions.

Attention is therefore drawn to the following Regulations :—

Regulations relating to Analyses performed in the Chemical Laboratory, Department of Agriculture.

Analyses of soils, fertilisers, fodders, plants, wheat, flour, water for irrigation or for watering stock, farm produce generally, insecticides, preservatives, &c., &c., are made by the Chemist gratis for *bonâ fide farmers and settlers, resident in New South Wales, only.*

No analyses will be undertaken for commercial purposes. These should be made by chemists outside the Department.

An exception is made in the case of manure manufacturers, or their agents, who wish to have analyses made of samples taken from bulk for the purpose of insertion in the annual list of fertilisers in the market published by the Department.

If it should be found that any farmer has taken advantage of this privilege of having gratis analyses made in order to have articles analysed for commercial purposes or for people not entitled to this concession, such privilege will be withdrawn from him, and he will no longer be entitled to have analyses made by the Department.

The Department reserves to itself the right of refusing to analyse any sample sent.

In cases where the Minister, after consideration, consents to an analysis being performed for persons other than farmers (with the exception mentioned above) a fee, payable in advance, will be charged as under :—

	£	s.	d.
Manures.—Blood, meat-meal, &c.	2	2	0
Bone manures, blood and bone, &c.	3	3	0
Mixed fertilisers	4	4	0
Soils.—Complete analysis	5	5	0
Partial analysis	2	2	0
Water.—Complete analysis	4	4	0
For irrigating or watering stock	2	2	0
Milk	1	1	0
Butter, Cheese, &c.—Complete analysis	2	2	0
Wine.—Complete analysis	3	3	0
Wheat.—Milling sample	2	2	0
Flour	2	2	0
Fodders.—Complete analysis	3	3	0
In all other cases.—For each determination made ...	0	15	0
If only one determination is made	1	1	0

Instructions for forwarding samples for analysis.

All samples should be addressed to the Under Secretary and Director, Department of Agriculture, and be accompanied by a letter giving instructions and name and address of sender.

The sample should bear either outside or inside the package, preferably both, the name and address of the sender for identification. If more than one sample is sent in a parcel, they should be numbered or lettered, so as to correspond with the numbers, &c., in the letter of advice.

Soils.—Owing to the length of time required to carry out a satisfactory analysis of a soil, and the fact that there are a large number always waiting their turn, some delay is unavoidable in furnishing the result. If the results are required before carrying out any particular operation, farmers are advised to send in the samples about three weeks beforehand.

For the guidance of farmers in forwarding samples of soil the following directions are submitted :—

1. Dig a hole where the soil is of average quality. Take a clean slice from it to the depth of 12 inches, and send 3 to 4 lb. of the sample, including stones, fibres, and everything.
2. Send also a sample of the subsoil, 1 lb.
3. If the soil in different parts of the field is manifestly of different qualities, samples of each kind should be forwarded.
4. Forms of application for analyses of soil can be obtained from the Department.

The Chemist's technical report will be fully explained, and experiments in manuring crops and treatment will be suggested, based on the analysis regarded in the light of the detailed history submitted with it.

In forwarding samples the name of the sender should be stated in the package, and if more than one sample is sent, each sample should be numbered to correspond with the printed form.

Manures.—In forwarding samples of manure for analysis, great care should be taken to ensure that the sample sent represents a fair average of the bulk. In the case of a dispute between vendor and purchaser, the sample should be taken in the presence of someone representing the seller, or in his absence in the presence of a police officer. Three samples should be taken and sealed separately, one to be sent to the Department for analysis; the second handed over to the seller's representative or the police officer; and the third kept with seals intact for future reference.

A sample from ¼ to ½ lb., or even less, is sufficient for analysis, provided it has been properly sampled.

Plants should be cut close to the ground, the cut ends enveloped in sacking, and sent away immediately after packing. A box knocked together of loose boards, with interstices between the boards, is the best, as if packed in a tight box they are certain to sweat on a long journey. When sending plants or other perishable articles, such as milk, &c., for examination, a letter advising their despatch should be sent a few days previously, addressed to "The Chemist, Department of Agriculture, Sydney," so that the analysis may be undertaken immediately upon arrival. The samples should be sent direct to the Chemical Laboratory, 136 George-street.

Waters for irrigating purposes and for stock should be collected in perfectly clean glass-bottles. One ordinary quart-bottle will usually be sufficient, except when a complete analysis is required, when two quarts should be sent. Each bottle must be corked by a perfectly clean, well-fitted cork, and sealed. The bottles must, of course, be securely packed against breakage.

Wheat and Flour.—For examining the milling qualities of wheat a sample of not less than 2 lb. weight is required. It should be stated whether the sample has been previously cleaned or not, and to what extent it has been cleaned. The name of the grain, if known, should also be supplied, as well as any information available as to the district, class of soil, yield per acre, &c. The Department does not undertake to name wheat from the grain.

Flour.—A sample of not less than 1 lb. is required for analysis.

The brand and manufacturer's name and any other particulars concerning the sample should also be supplied.

How to Destroy the Fox.

At the twenty-eighth congress of the Agricultural Bureau of South Australia held in Adelaide in September last, Mr. W. H. Cuming, of Strathalbyn, read a practical paper on the fox and how to contend against him, based upon his experience for over twelve or fifteen years in that district. His method of destroying the pest is as follows:—

> It was always thought that the fox was a very cunning animal, but that is not correct. The dingo is a long way ahead of the fox for cunning. One can use almost any sort of meat for bait—suet, caul fat, liver, young rabbit, lamb, fish, mice, opossum—but I find the rosella parrot the best, for if they are passing a parrot bait they must have a bite at it, and very often swallow the parrot, feathers and all. By using parrot baits, it is always quite safe to take sheep or cattle dogs after the stock without fear of getting them poisoned, as they will not eat a parrot. When laying baits, put them close to a sheep or cattle path, or any old road through the paddock. Place all meat baits 1 inch under the ground; if parrots, cover over with bark, leaves, or grass to hide from night birds. When a bait is missed, if in hilly country, always look on the higher land, above where the bait was laid, and the dead fox is mostly found. If on the plains, search along the path or road, and the fox will soon be found. Along the banks of creeks is a good place to put baits. Do not be afraid of using too much poison; if too little is used, the fox will get away and will not be found, and the skin will be lost. Put as much strychnine as will lie on a threepenny-piece in each bait. Always put baits out six weeks before the lambing starts. Keep putting some out every week up to and through the lambing season, and a few all the year round. If all stock-owners would lay poison, the fox pest would soon be reduced to a minimum, and would not be the menace to the breeder which it is at present. I have been over forty years fighting vermin—first the dingo, then the rabbit; the last fourteen years the fox, and the last-named is going to be very much worse to contend with than either dingo or rabbit.

INTER-STATE CONFERENCE OF AGRICULTURAL SCIENTISTS.

A CONFERENCE attended by agricultural scientists from all the States, convened by the Federal Government at the instance of the Advisory Council of Science and Industry, was held in Melbourne from 9th November to 16th November, 1917. Professor A. J. Perkins, Director of Agriculture of South Australia, presided. A number of papers dealing with different aspects of agricultural science were read before the Conference, and valuable discussions took place on each subject. The papers, with a summary of the discussions, will shortly be published by the Advisory Council. The topics dealt with were as follows:—

Wheat-breeding (introduced by H. Pye, Victoria); Oats and Barley-breeding (J. T. Pridham, New South Wales); Maize-breeding (H. Wenholz, New South Wales); Statistical methods applied to Plant-breeding (Dr. W. H. Green, Victoria); Production of Cereals for Arid districts (A. E. V. Richardson, Victoria); Immunity and Inheritance (D. McAlpine, Victoria); Plant Acclimatisation (G. L. Sutton, West Australia); Utilisation of Australian Phosphate Deposits (Professor J. W. Paterson, West Australia); Tobacco Culture (T. A. J. Smith, Victoria); Utilisation of Native Grasses and Fodder-plants (E. Breakwell, New South Wales); Fibre-crops (T. Hogg, Victoria); Sugar-crops (H. T. Easterby, Queensland); Crops for production of power alcohol (W. R. Grimwade, Victoria); Suggestions as to Commonwealth endowment of agricultural research (Professor A. J. Perkins, South Australia); Agricultural research and co-ordination of effort (Professor R. D. Watt, New South Wales).

The following resolutions were carried by the Conference, and have been forwarded to the Executive Committee of the Commonwealth Advisory Council of Science and Industry:—

1. This Conference recommends to the Executive Committee of the Advisory Council that a "Seed Improvement Committee" be formed under the Council.

This Committee should, among other matters, deal with:—

(a) The nomenclature of cultivated varieties of farm crops.
(b) The elimination of undesirable varieties of crops.
(c) The exchange and dissemination of seed samples for research work.
(d) The recommendation of money grants to approved State or other institutions for work in connection with seed improvement and the introduction of improved varieties of crops.

2. That in view of the benefits to be derived from the systematic introduction of seeds and plants into the Commonwealth and to ensure more economy of effort in this direction on the part of all the States, this Conference is of the opinion that as soon as practicable a Plant Introduction Bureau should be established, the functions of which would include:—

(1) Arrangements for the introduction of new and useful agricultural plants from other countries into the Commonwealth.
(2) The systematic testing of these introduced plants in co-operation with State Experiment Farms.
(3) The systematic recording of the results of such tests.

3. That this Conference recommends that each State Department of Agriculture should continue or initiate the work of improvement and selection of its cultivated crops as part of its regular work, and that such work of improvement be on uniform lines in all the States.

4. That the rust in cereals, particularly black rust in wheat, which is common in all the States, and in some seasons largely reduces the yields, be made the subject of a special investigation in connection with plant breeding.

5. That the Executive Committee of the Advisory Council be asked to arrange for an annual meeting of plant-breeders from the different States, with a view to co-ordinating their work, and arriving at a uniform policy without interfering with individual methods; the meeting to be fixed at a convenient season of the year (July).

6. That this Conference recommends the establishment of an organisation to deal with the collection, propagation, improvement and cultivation in suitable areas of the most promising indigenous grasses and fodder plants.

7. That this Conference recommends to the Advisory Council of Science and Industry the advisability of closely investigating the tobacco industry in Australia, both in the interests of the producer and with a view to retaining locally the profits of manufacture.

8. That in view of the high prices ruling for fibre products and the desirability of making Australia self-contained in the production of fibre, the Conference recommends the Advisory Council of Science and Industry to make a thorough investigation into the possibilities of fibre cultivation in Australia, particularly flax and sisal hemp, and the possibilities of producing these fibres for local manufacture or for export.

9. That the Advisory Council of Science and Industry be asked to ascertain whether the British Government would be prepared to purchase dew-retted flax fibre from Australia in 1919, and if so what quantities and at what price f.o.b.

10. The Conference is of opinion that the prospect of commercial production of power alcohol from certain crops is promising, and suggests that special experiments should be arranged by the Advisory Council of Science and Industry to determine the actual yields of alcohol obtainable from these crops including sorghums in various stages of development.

11. That this Conference welcomes the proposal of the Advisory Council to investigate the utilisation of Australian phosphates, and suggests that this investigation should include manurial trials, particularly on pasture lands, in those of the States which possess such phosphates.

12. That in view of the need for a supply of scientific investigators into agricultural and pastoral problems, the Advisory Council of Science and Industry be requested to direct the attention of the various Australian Universities to the subject.

13. In view of the prominent position occupied by the United States of America in scientific and practical agriculture, and of the similarity of the climatic and economic conditions of that country to those of Australia, this Conference recommends the early appointment of a permanent agricultural representative from Australia to the United States, whose duties should include keeping Australia in touch with improved scientific and practical methods in agriculture and the supply of promising varieties of cereals and other crops.

14. That this Conference expresses its appreciation of the action of the Executive Committee of the Advisory Council of Science and Industry in calling it together, and is confident that the opportunity of meeting and consulting together thus afforded to agricultural scientists from the different States will be beneficial to agricultural progress in Australia.

QUANTITIES OF VEGETABLE SEEDS REQUIRED FOR VARIOUS AREAS.

THE *Journal of the Board of Agriculture* (England) has published valuable tables, showing the quantities of seed required for areas of various sizes, with the view to ensuring economy in the use of vegetable seeds. While the conditions in this State differ considerably from those in Great Britain, the figures will be found of considerable interest. They may be summarised as follows :—

Quantity.	Vegetable.	Sown.	Total Length of Row.
1 ounce	Beet	8 inches apart	400 feet.
1 ,,	Carrot	6 ,, ,,	600 ,,
1 ,,	Lettuce	6 ,, ,, (small varieties)	600 ,,
1 ,,	,,	12 ,, ,, (for large)	900 ,,
1 ,,	Onions for harvesting	4–6 ,, ,,	350–480 feet.
1 ,,	Onions for pulling green	Continuously along drill	180 feet.
1 ,,	Parsley	4-6 inches apart	350 ,,
1 ,,	Parsnip	8 inches apart	300 ,,
1 ,,	Swede	9–12 inches apart	800 ,,
1 ,,	Turnip	6 inches apart	600 ,,
1 pint	Broad Bean	9 ,, ,,	100 ,, double row.
1 ,,	French Bean	6 ,, ,,	200 ,, ,, ,,
1 ,,	Peas	2 ,, ,,	60–80 feet double row.

Poultry Notes.

JANUARY.

JAMES HADLINGTON, Poultry Expert.

On taking a retrospective view of the poultry industry during the year just closed a good deal of solid progress appears evident. It is noteworthy that notwithstanding the high prices of timber and iron good poultry buildings have been erected, and efficient equipment installed in all directions, and there appears to be a disposition among poultry-keepers not only to increase but to improve their flocks.

Another feature that is full of promise is the fact that utility poultry-farmers, as represented by the Utility Poultry Breeders' Association, have recognised the necessity of a standard under which their birds can be judged at shows, and as a guide to breeders. This should, and doubtless will, have far-reaching effects for good upon the quality of the poultry kept throughout Australia, and will be an educational factor of no small significance.

The offering of presentation shields by the Poultry Club of New South Wales for the best laid out and most efficiently conducted farms in the metropolitan area, also betokens an awakening interest in the prime needs of the industry. It would appear therefore that forces are gathering and uniting that promise well for poultry-raising generally.

A further feature of the year has been the activity of different agencies which endeavour to induce the public to take up poultry-farming as a means by which their incomes might be increased or a livelihood made. From the point of view of increasing production and national wealth this might be deemed satisfactory. But unfortunately there is another side of the question that cannot be so considered. It is feared that many persons having no qualifications for the business are being induced by glowing accounts of profits to be made from poultry-keeping to take up the industry, and many are investing their hard-earned savings in attempts of this kind, in many cases without possessing the necessary capital, experience, or aptitude to ensure success. Most persons have an idea that they know something about poultry-keeping. But keeping a small number of hens and poultry-farming for a living are quite different propositions, and the public will be well advised to go carefully into the matter and seek sound practical advice before taking too seriously a good deal that is at present current on this subject.

It may scarcely be necessary to again emphasise the fact that the industry is sound as far as the small farmer with the necessary qualifications and working under proper conditions is concerned.

Autumn Hatching.

The middle of this month will be none too early to commence setting eggs for what is known as autumn hatching, but which is, more correctly speaking, late summer hatching. It is not intended here to go into the merits or demerits of hatching during these months, because they have so often been stated; suffice it to say, that it is regarded more as a poultry-farmer's "catch crop" than a regular part of his seasonable work. Pullets hatched during February and March may be regarded as less prolific layers than those hatched in the spring, but a compensating factor is the high price that usually rules for the cockerels marketed from May to the end of the year, *i.e.*, so long as they are good sorts and well grown.

The essentials for success in making this catch-hatching are that good eggs are available from stock that have not gone off condition, and that the ground over which the new chickens are to be run has had a couple of months' rest before it will be required to carry them. This is all the more necessary where chickens are run in fairly large numbers. Pullets from these hatchings usually come on to lay about the following August, but even then should not be expected to equal in laying capacity the birds hatched in spring.

One question often asked by beginners is, "Will it pay to buy breeding stock to lay eggs to hatch at this time?" It is only in exceptional circumstances that such a course can be advised, and hatching at this season is, generally speaking, best left to those who have the stock from which birds in fair condition can be selected to breed from.

Chicken Pox or "Warts."

The humid conditions that have prevailed so far this summer might be expected to result in an early outbreak of chicken pox, and poultry-keepers will do well to commence right away to protect their young stock from this very troublesome disease. The method advised is to give flowers of sulphur at the rate of one tablespoonful to fifty adults in the morning mash twice or three times a week for two or three weeks; then change this and give Epsom salts in the drinking water over a like period at the rate of one ounce packet to the gallon. But the two should not be given over the same period, and care should be taken not to overdo the sulphur, as it may result in some pullets breaking into moult. At the same time the cause of all pullets so breaking should not be attributed to this, because many will do so in any case. But even some risk in this respect is preferable to an outbreak of chicken pox.

To meet the cases where the dry mash system is in use, the best method of giving the sulphur would be to mix sufficient mash to act as a vehicle for the sulphur, and feed it at any time during the day.

Where the automatic watering system is in use, the Epsom salts can only be put in the mash portion of the food. The difficulty here is that many of the birds fail to eat it, and these would be likely to contract the disease where it is present.

A Reminder.

Many hens will now go off laying and others will only lay in an erratic manner, and very soon fall into moult. This is a matter that should receive the close attention of poultry farmers with a view to disposing of the unprofitable hens, and all those that it is not intended to carry through the moult into next spring should be carefully scrutinised and marketed as they go off laying. It should not be a difficult matter to pick out the hens that have stopped laying, but I find that there is a disposition among beginners, and also many whose experience should have taught them differently, to expect these hens to come on to lay again at an earlier period than they are likely to do. Each year this idea is responsible for a great deal of loss resulting from keeping these old hens. The fact of feed being somewhat dear, of course, accentuates the trouble; but it is an experience occurring every year, and it is not realised until a good deal of loss has been sustained. These old hens are kept on month after month with the hope that they will come on to lay again soon. Some, of course, do so; but the greater part of those that stop laying after the end of December will probably be found to lay very few eggs until after the moult, and remain unprofitable until the end of June or even later. Good second-year hens should, of course, become profitable from that time on to the following January or February, when consistent culling of the non layers should be practised.

To define what is understood by first, second, and third year hens: A pullet is considered to be such up to twelve months old, but she may be considered in her first year of laying until after her first moult, say, to the end of March. This, of course refers to seasonably hatched stock. She may then be considered to start on her second year laying, and be classed as such until, say, the end of March again. But should she cease laying after the end of December it is advisable to dispose of her (unless reasons other than her mere laying qualities warrant her retention), as this stage is considered to terminate the profitable life of most layers. For all practical purposes the profitable life of a hen that was hatched during the spring is from 27 to 30 months, while a small percentage remain profitable a couple of months longer.

Agricultural Bureau of New South Wales.

Greetings for 1918.

I am glad to be able to state that during the past year the Agricultural Bureau has again made solid progress. Nine new branches have been established, and the number would, doubtless, have been much larger but for the fact that the war has greatly interfered with such work.

In spite of this, however, not only have new Branches been firmly established, but many of the older ones have made a great advance in membership and efficiency. The reports which the Department receives testify to the useful work which is being carried out by the Bureau throughout the country.

The Minister of Agriculture and the staff of the Department join with me in hoping that the new year will bring continued success to the Bureau and happiness and prosperity to every member.

George Valder

Under Secretary and
Director of Agriculture.

Sydney, 2nd January, 1918.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Albury.

The annual meeting of the branch was held on 5th December. Mr. F. Wells presided and there was a fair attendance, including a number of ladies. The report mentioned that the exhibitions of summer and winter pruning and a lecture by Mr. Patterson on "Organisation in Agriculture" were the principal fixtures of the year. A new feature was the obtaining from the Public Library, Sydney, of books dealing with rural matters. The balance-sheet disclosed a credit balance of over £6.

The election of officers resulted as follows:—Chairman, Mr. J. Brann; Vice-Chairman, Mr. J. Fleming; Treasurer, Mr. H. Hague; Hon. Secretary, Mr. N. L. Morton; Assistant Secretaries, (Lavington) Mr. A. A. Buchhorn, (Albury) Mr. H. Eberle, sen., (Thurgoona) Mr. J. R. Wignell.

Reference was made to the large amount of useful work done by the retiring Chairman, Mr. Wells, and the appreciation of the branch was recorded in the minutes.

Mr. Brann gave an impromptu, but most interesting address on poultry, in the course of which much valuable information was gained by those present.

Bankstown.

Mr. W. Grant, Superintendent of the Outer Domain, Sydney, gave a lecture to the members of this branch on rose-growing on 26th November.

Bimbaya.

A meeting was held on 1st November at which Mr. W. F. Irvin read a paper, from which the following is taken:—

POULTRY-KEEPING.

The whole profit in poultry is determined by the selection of breeding and laying stock. Poor layers can put the egg-farmer out of business in a very short time; poor breeding stock will do it as thoroughly, as the loss is not only the time and money required to rear them, but when grown they are still a loss through not producing. Some people keep all the pullets they rear, just because they are pullets, and they often discard hens that would prove profitable layers. A poor laying pullet is likely to prove worse than a poor laying hen, because she will probably be kept over a longer period. On a number of farms it is the practice to discard hens of a certain age, after two or three laying seasons, renewing the flocks with pullets. No special attention is paid to the condition of either hens or pullets, their usefulness being determined by their age. This is not always a safe plan, as it means discarding good and bad layers and replacing them with others of the same calibre. The chances are that the pullets will produce more eggs in winter and early spring, but will they pay sufficiently to repay the cost?

It would be unwise to deprecate the value of *well*-selected pullets as winter layers—in fact, they are practically the only source from which eggs can be procured at this time—but when two or three hundred pullets are placed in the laying pen and only one-third of them lay, and even these only to the extent of one-third (the egg-laying competitions at Hawkesbury College prove that during April, May, and June the production is only about 1 egg in 3 days per pullet, and 1 in 10 per hen) there is very little profit. The pullet that waits till spring is advanced before commencing to lay will probably be an indifferent layer all her life. It is next to impossible to get hens through the moult and laying before the end of June, while well-grown pullets should come on to lay in March and lay well from then on. Some will commence when they should, but unless they are closely culled they will not. This number may be large or small according to the quality of the parent stock.

It is safe to say that the country over, not half the poultry are worth keeping. A hen or pullet that does not pay for her feed and a bit over would be of more profit to her owner on the dinner table than in the laying pen. There are a number of ways of weeding out poor hens. Some use a trap nest (a nest that does not let the hen off until freed by an attendant); others run the hens in single pens; while some become so expert that they can tell the possibilities of a pullet, with a fair degree of accuracy, simply by handling her.

In selecting hens the first requirement is vigour. If they are bright and active, and show they have good constitutions, large crops and abdomens, and other points, they may be kept with profit regardless of age. Some hens are almost as good at five years old as they were as pullets. Some pullets do not have vitality enough to commence laying in cold weather. It takes a pretty vigorous pullet to consume enough food to sustain herself and have enough material for egg-making in cold weather. She could easily eat enough, but cannot digest it because of lack of exercise.

Unless we can properly select our breeders, the percentage of good pullets we raise will be small, consequently the number of rejects will be large. If not discarded they will turn the profits into loss or so reduce them that we receive very little recompense for our labour. Then these will go on and breed us more poor pullets until the whole venture is a failure. So that it is necessary to be culling unceasingly.

To succeed in poultry culture, and especially in egg-production, there are three things that must be learned and learned well. The first is how to grow good pullets; secondly, how to know them when grown; and thirdly, how to feed them for best results. Correct methods of feeding are essential to keeping even good birds in robust health, and are quite as important as the nature of the food, always providing that it is a sound class of food. The most scientifically balanced ration containing all necessary constituents would be useless if birds could not digest it. Experience has abundantly proved that the most satisfactory results, as to both egg-production and growth, are obtained from pollard, bran, maize, wheat, and oats, which have become the universal poultry foods, not only from their suitability and the uniform results obtained, but as being the most economical foodstuffs and the most easily obtained in large quantities. As an instance of what may be called a normal, simple, and well balanced ration I quote that fed at Hawkesbury Agricultural College:—Morning—A mash in the following proportions: Pollard 60 lb., bran 20 lb., lucerne dust 12 lb., meat meal 8 lb. Evening—$\frac{2}{3}$ wheat, $\frac{1}{3}$ corn, as much as the hens will clean up.

Buckaroo.

A meeting was held on 27th October, when Mr. P. J. Crowley read a paper on sorghum, from which the following is taken:—

SORGHUM.

Sorghum, on account of its value as a fodder for practically all classes of stock, is worthy of the consideration of any farmer who is engaged in mixed farming, or who is keeping stock on his farm. The most serious drawback to its use is the poisonous nature of the young plants, which makes it unsafe to feed sorghum to stock until it has reached the flowering stage. If it is intended to feed it before that stage, the plants should be cut and allowed to wilt for at least twelve hours.

Sorghum is a very sweet fodder and it is greedily eaten by stock; and as the stems of the matured plant remain succulent for a considerable time after the frost has killed it, it is the means of providing a valuable fodder during the late autumn and early winter. It can be fed with advantage to cattle, horses, or pigs, and the seed makes good fowl feed; and while it cannot be claimed that it is a first-rate milk producer, or that horses will do hard and constant work on it, or that it alone will fatten pigs, it can be asserted that with sorghum a fair supply of milk will be maintained, dry cattle will thrive, idle horses or horses doing odd jobs will be kept in good condition, and with green sorghum and small quantities of more nutritious foods store pigs or breeding sows can be held. Another strong point in its favour is that in the event of the cereal hay crops failing, the land can then be sown with sorghum with every prospect of a good crop if the season is at all reasonable; or in a favourable year good crops can be grown after the hay crops are harvested, and will thus provide a fodder that will save the more valuable cereal hay.

Sorghum is not particular as regards soil; good crops can be grown on almost any class of soil providing the cultivation is good, though, of course, rich land will always give the best crops. The land should be ploughed as deeply as possible early in the winter, and allowed to lie open till the spring, when it should be harrowed down and then harrowed after every fall of rain till sowing time, when the soil should be in such a condition that it can be brought into a good tilth by either ploughing or cultivating. It is imperative that the soil should be in good tilth and warm before the seed is sown. The best time to sow is during the latter part of October or early in November, although under favourable conditions good crops can be grown by sowing any time before the middle of January.

There are two methods of sowing. The first is to strike out drills with the plough about 3 feet apart and drop the seed, about 7 or 8 lb. to the acre being sufficient. This method has much to recommend it on account of it being possible to cultivate between the rows and to thus kill weeds and conserve moisture. After the plants become a fair height the cultivation should be very shallow or the roots will be disturbed. A quick and effective way of sowing in drills is to stop up the runs in the seed drill, so as to make the rows the required distances apart. The second method of sowing is to broadcast the seed at the rate of 14 lb. per acre. By this method heavier crops can be grown, providing the season is good, but in a dry season cultivation between the rows will ensure crops that would be impossible with the broadcast method.

To the average farmer it is the harvesting of the crops that presents the greatest difficulties, as for a small area it does not pay to purchase the necessary machinery. Light crops of medium height when the stalks are fine can be cut with the reaper and binder and made into hay; no doubt much of the feeding value is lost, but the hay might be the means of tiding stock over a bad time. A method that is worthy of consideration is to turn the stock in after the frost has killed it. They will generally eat it right down to the roots and very little is wasted, while the droppings will enrich the soil as manure. This method has much to recommend it where sorghum is used as a rotation with other crops.

Cattai.

The annual meeting took place on 10th November, the election of officers resulting as follows:—Chairman, Mr. R. J. Tolson; Vice-Chairmen, Messrs. G. Brown and E. H. Paull; Hon. Secretary and Treasurer, Mr. A. J. McDonald, J.P.

The report showed that substantial work had been done during the year, including the winning, for the second time in succession, of the prize for Bureau exhibits at the Hawkesbury District Agricultural Association's annual show.

Mr. Thomson exhibited thirteen varieties of cereals at the meeting, and stated that the exhibit was considerably spoilt owing to the rain, as twenty distinctive varieties were destroyed.

A meeting took place on 28th November, the business being the consideration of the abnormal rainfall and its effect upon the crops of the district.

Cordeaux-Goondarin.

A well-attended meeting of this branch was held at Kembla Vale on 31st October. The holding of an apple exhibition in February or March next was discussed. Mr. A. E. Fishlock read a paper on potato growing, of which the following is a synopsis.

POTATO GROWING.

Good crops of potatoes can be grown on a variety of soils, provided they are well prepared, and, if not naturally fertile, heavily manured. Potatoes thrive best in a naturally deep, rich loam, rather light than otherwise, and many volcanic soils possess these characteristics. Whatever land is chosen must be deeply ploughed, and, if necessary, cross-ploughed and brought to a fine tilth with the harrow or scarifier before the seed is planted. Potatoes will not do well on heavy or wet clayey land. Very poor crops of tubers are obtained on some farms, and this is not always due to inattention in the way of cultivation. If the soil does not contain constituents which are necessary for the requirements of the potato, ploughing or scarifying will not supply the deficiency, although it will benefit the crop a great deal.

The selection of a manure is a most important matter and its application must depend upon the nature of the soil, the climate, and the variety. In soils where the tops grow too luxuriantly, no manures that would be likely to increase that luxuriance should be applied. Manures suitable for the potato are farmyard and stable manure, wood ashes, lime, sulphate of ammonia, nitrate of soda, sulphate of potash, and kainit. To spread farmyard manure along the bottom of the drills and place the seed on the manure is a very common practice, but I prefer planting the sets and then laying the manure over them. Twenty tons of farmyard manure is sufficient for an acre.

The selection of the seed is most important, and care should be taken that only good sound sets are planted. I choose medium-sized tubers in preference to small ones. If it should be necessary to cut the sets, see that each portion has one or more good eyes. It is a well-known fact that sets taken from the points or top ends of the tubers produce the heaviest crops.

It will require about 8 cwt. of medium-sized potatoes to plant an acre, and if a light horse-scarifier is used in cultivation the rows should be 3 feet apart and the sets 12 inches apart in the rows. As a rule, about 6 inches is the proper depth to plant the sets. In favourable localities the early varieties may be planted in June or July, the second early sorts a few weeks later, and the main crop in September. The early varieties may again be planted for an autumn crop in January and February. In order to expedite the work of planting, furrows should be opened with a plough. If the land is naturally fertile or heavily manured, the work could be done as the ploughing proceeds by dropping the sets at the proper distances in every third or fourth furrow, and covering them with the following furrow. After the planting is finished the land should be harrowed. The cultivation necessary is to scarify the soil between the rows and hoe between the plants in the rows to keep the weeds down and the surface loose; earthing up should be done when the plants are high enough. Under ordinary conditions the crop will require no further attention until it is ready for digging.

When the tops turn brown it is a sign that the crop is ripe, and the potatoes are ready for lifting. Where large areas are grown, this is mostly done with a suitable plough or potato-digger. The crop should, if possible, be lifted when the soil is dry and the weather fine. Then the potatoes will keep well if properly stored. Potatoes should not be exposed to the sun after being lifted. They should lie on the ground in heaps for one day, and be covered with tops or bags until stored. Potatoes keep well in small quantities when stored in a cool dry loft or cellar. The light should be entirely excluded by covering them with straw. The following varieties are suitable for this district:—Early varieties—Early Rose, Early Vermont; main crop—Brownell's Beauty, Manhattan, Satisfaction, Snowflake.

If any disease be prevalent in the crop, Bordeaux mixture should be applied as a spray, the proportions being 6 lb. copper sulphate, 4 lb. quicklime (in lumps), 50 gallons water.

Cotta Walla.

A meeting was held on 6th November, at which Mr. T. J. Kennedy read a newspaper article on the value of a pure-bred dairy sire.

Mr. G. W. Butt contributed a short paper, from which the following notes were taken:—

HARVESTING ALGERIAN OATS.

Algerian oats are the principal hay crop in this district, and to make them into choice hay they should be reaped as soon as the tips of the heads begin to turn brown. If cut then, both weight and colour will be obtained. When reaping the crop with the binder, if the weather is hot and dry, it is advisable to tie a medium-sized sheaf, but small sheaves are preferable in wet, showery weather. As soon as possible after they leave the machine, the sheaves should be stooked in small stooks containing six or eight sheaves, always putting the flat side of the sheaf inwards, and standing the sheaves well out at the butt to prevent the stook from falling. Cap sheaves are an improvement to the stook in wet weather if they are carefully put on. A few sheaves must be carefully tested before carting in commences, to determine whether the hay is properly "made." The grain will have a firm, solid feeling, and straws taken from the middle of the sheaf will feel dry and free from sap; if hay is carted in too soon, it will heat in the stack, and become brown in colour, which will not only spoil the quality of the hay, but will result in a loss of weight as well.

When harvesting for grain the crop should be left standing till quite ripe, so that the grain will be well matured; if reaped on the green side, there will be a lot of small grains that will give a poor germination if sown the following season.

Mr. R. N. Makin, Inspector of Agriculture, visited the district on 19th November, and supervised the planting of a potato experiment plot.

A meeting was held on 4th December, when a discussion took place on the various methods and styles of stooking hay.

Jilliby-Dooralong.

At a meeting held on 3rd November, Mr. H. Wenholz, B.Sc., Inspector of Agriculture, delivered an interesting lantern lecture on maize culture. In spite of the inclement weather about thirty persons attended.

Kellyville.

A meeting was held on 1st December, which was attended by twenty-one members. A demonstration of the mixing and general use of red spraying oil was given, which proved valuable.

Lidcombe.

A meeting was held on 19th November, when Mr. J. Frost read a paper on the management and care of a lawn. Mr. Frost was the winner of the competition for the garden showing the most improvement during the year, and it has been decided to continue the competition for the coming year.

At a meeting held on 3rd December, Dr. J. M. Suckling, of the Board of Health, delivered a lecture entitled "Municipal Health."

Matcham.

The annual meeting took place on 24th November, the election of officers for the ensuing year resulting as follows:—Chairman, Mr. J. S. Heath; Vice-Chairmen, Messrs. C. Marks and T. R. Michelsen; Hon. Secretary, Mr. W. R. Crossland; Treasurer, Mr. Amelio Macinante.

Moruya.

The members of this branch assembled on 6th November, and assisted to plant the maize on the experiment plots on Mr. J. J. Heffernan's farm. Twenty-four varieties were sown.

Moss Vale.

A branch has been formed at this centre, with a membership of fifty. Mr. R. N. Makin, Inspector of Agriculture, delivered a lecture at the first meeting of the branch on 26th October, the subject being artificial manures.

A meeting was held on 23rd November, at which thirty members were present. Ten new members were admitted.

A paper was read by Mr. H. J. Lambeth, A.F.I.A., on book-keeping for farmers. The paper was freely discussed by members, and many questions were answered by the lecturer.

Nimbin.

This branch staged a very fine exhibit at the Lismore Show on 14th and 15th November, securing the prize of £12 given for the best district exhibit of farm produce. The exhibit comprised farm and orchard products together with fine samples of butter and honey.

Orangeville.

A meeting was held on 27th October, at which Mr. A. Blackett-Smith gave a lecture entitled "Profit from Waste Fruit." After pointing out the necessity for avoiding waste as far as possible, the lecturer recommended two ways of dealing with waste fruit, namely, pulping and evaporating. If these two methods were put into operation they would require but little plant and capital, and would be fairly profitable. The lecturer showed some interesting samples of evaporated peaches, apples, and pears.

The branch has taken up the question of the prevention of fires in the bush-country from spreading to the grass lands of the settled areas, and residents of the district are being called together for the purpose of ensuring organised effort.

Orchard Hills.

The members of this branch paid a visit to Hawkesbury Agricultural College on 21st November. At the monthly meeting on 26th November the members engaged in a general discussion on the information gained during their visit.

Robert's Creek.

Mr. D. S. Thompson, Poultry Instructor at Grafton Experiment Farm, gave a lecture before this branch on 7th November. In spite of the very inclement weather there was a good attendance. A number of questions were answered by the lecturer.

Spencer.

A meeting of this branch was held on 17th November. Owing to the recent floods in the district a discussion took place on the best methods of combating flood-wash, and of re-soiling flood-washed ground.

Springside.

A meeting was held on 30th October, at which Mr. T. Commins read a paper, of which a summary follows:—

VARIETIES OF POTATOES.

Mr. Commins commenced by mentioning the varieties he had tried, and then suggested that much can be done in the direction of cultivating new and more suitable varieties. That was a work that should be taken up systematically by a number of growers, who would compare their results at the end of each season. Such experiments should be carried out under ordinary conditions, as applied to the growing of our main crops. Going back a number of years, he referred to some of the varieties that had been grown in the district. The first mentioned was Snowflake, or White potato, a prolific cropper in good seasons, but not profitable on account of its poor table quality; it was, however, absolutely the best keeper grown at that time, its edible quality increased with age, and when other kinds were unfit for food this sort was at its best. Next in order was the old Redskin, which must not be confused with the Redskin grown in recent years. The one referred to was grown about thirty years ago; a good cropper, long, and narrow in shape, not good for table purposes; it tended to run out quickly. After this came the old Blue, a good cropper, similar in shape to the present Blue Manhattan, but longer; it had a strong tendency to run out. Following that came Brownell's Beauty, an excellent table variety; not a heavy cropper during unfavourable seasons; light red in colour, long in shape. The second variety of Redskin was an excellent table sort, similar to Blue Manhattan in shape, but with the fault of running out quickly. Queen of the Valley received attention about the same time, but did not do well in that district. The next, Bliss' Triumph (a very round potato, with deep eye, rough skin, and light colour), proved to be of little use for table purposes; it was somewhat of a soapy, sticky nature when cooked.

Closely allied was the Pinkeye, as it was known, the slight difference being a smooth skin, and also a slight pinkish tint in colour. In this variety the small ones usually exceeded the large. The Freeman, a good cropper (in fact, too good, for it grew so large as to become hollow), was not, as a rule, good for table purposes. The last was Manhattan, of which there were two kinds, early and late; the late received preference; it was blue in colour, variable in shape, a good cropper, but at present showing a tendency to run out.

After growing tubers for a few seasons, Mr. Commins went on to remark, there was inevitably a tendency for the true strain to gradually run out, and if the farmer continued to produce on those lines, practically a new variety of inferior size, shape, colour, and quality was the result. He found that the best method of preserving the best strain was to select for seed purposes those plants that were found in every good crop which outstrip their neighbours in every respect, and to plant only the tubers from those. A little time spent in that direction would be handsomely repaid in good crops of marketable potatoes.

Departmental Note.—The Chief Inspector remarks that the surest way to ascertain the most suitable variety for the district is to establish experiment plots, and to test the different varieties against one another. Farmers who have new varieties should bring them to the experiment plots, and plant them there for trial against well-known varieties; much useful and valuable information could be obtained in that way.

St. John's Park.

A meeting of this branch was held on 16th November. Mr. J. Secombe gave a lecture on strawberry growing, during which he pointed out that beginners should be careful to buy their plants from growers known to have a clean strawberry bed, as it was easy to introduce disease at the very commencement. Vegetable manures were better than chemical ones, and street sweepings were good, but better still if well rotted. A mulch should be applied at the end of the winter; it saved trouble, and kept the strawberries clean and the ground moist. The rows should not be less than 2 feet apart, and if a horse cultivator was to be used they should be 4 feet. All berries should be picked whether they were good or bad; it prevented the spread of mould among the fruit. Growers should always grade the fruit. Creswell's seedling was the best variety for the district, other varieties being subject to leaf-mite. Where irrigation was possible, water should be applied in dry weather to ensure good crops.

Valla.

A meeting was held on 29th October, at which a discussion took place on lucerne. A bunch of lucerne grown by Mr. W. Mackey was exhibited, and was very highly commended by members.

Woonona.

The monthly meeting was held on 13th November, the attendance being satisfactory, in spite of inclement weather. Seventeen new members joined the branch.

It was decided that members should make a collection of insects, both friendly and harmful, to form an exhibit for the branch. A discussion took place on the management of chickens.

Yurrunga and Avoca.

The annual meeting of this branch was held at Avoca on 24th November. The Secretary's report showed that a substantial increase in the membership had taken place during the year, and the Treasurer's report showed the finances to be in a satisfactory condition.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bankstown	J. W. Cunningham, Brancourt avenue, Bankstown.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	J. R. Boller, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Buckaroo	P. J. Crowley, Buckaroo.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton, Comboyne.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kelk, Black Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Creek, Frogmore.
French's Forest	J. W. West, French's Forest.
Garra & Pinecliff	S.W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jilliby-Dooralong	K. A. Smith, Jilliby, Wyong.
Jindabyne	Sylvester Kennedy, Jindabyne.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Daniel Kearney, Kellyville.
Kyogle	M. P. Dunlop, Kyogle.
Lankey's Creek (Jingellic).	[Suspended.]
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	A E. J. Anderson, B.A., Platform-street, Lidcombe.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	T. L. Williams, Meadow Flat, via Rydal.
Middle Dural	A. E. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	W. H. Paine, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Moss Vale	W. G. Bale, Moss Vale.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	C. P. James, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Quaker's Hill	C. Gardner, Blacktown.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, W. Wyalong.
Spencer	H. J. Woodbury, Spencer.
Springside (via Orange).	E. H. Selwood, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	W. Snushall, Tallong.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Tennyson (North Richmond).	J. E. Sweet, North Richmond.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Tingha	J. T. Robilliard, Tingha.
Toronto	J. Froome, Knowle Farm, Toronto.
Ulan	P.S.D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wetherill Park	A. J. Hedges, Wetherill Park.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	J G. Downie, Wolseley Park.
Woonona	W. H. Moss, Campbell-st., Woonona.
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yarramalong	L. Hodges, "Greylands," Yarramalong.
Yetholme	—
Yurrunga and Avoca.	F. Saville, Yurrunga.

Orchard Notes.

JANUARY.

W. J. ALLEN.

This season the frequent rains have made it very difficult in many places to keep orchards and vineyards well cultivated. Fortunately under such conditions cultivation is not esssential; but the grower should be watchful, and as soon as the soil is dry enough he should at once make use of the opportunity to get the land in good order, as when it is carrying a heavy coating of weeds it will very quickly dry out, and the trees will suffer from lack of moisture during the latter part of the summer. It may be necessary in many orchards, where the growth of weeds is heavy, to use the plough instead of the cultivator.

Irrigation.

If the weather has turned dry, it may be necessary to give trees and vines an irrigation this month, where water is available. Care should be taken to follow such irrigations with thorough cultivation as soon as the land is dry enough to work, and before it has baked down hard.

Scale on Citrus Trees.

Fumigation or spraying for the destruction of scale can be commenced this month if the young scale have hatched out. The grower should watch carefully and constantly in order to select the best time, as if the work is done too early the eggs that have not hatched will survive, and the trees will become reinfested.

Owing to the frequent rains throughout the early part of the summer, the trees should be in condition to stand either fumigation or spraying. The former should only be carried out at night, or on cool cloudy days when the sun is not shining. The trees should be dry, and on no account should they be fumigated after having been sprayed with Bordeaux mixture, or other copper sulphate compound. Care should be taken to avoid spraying during very hot sunny days.

When fumigating, in breaking up potassium cyanide into pieces for the purpose of weighing out the doses, a certain amount splinters into very small pieces. Care should be taken that only a small quantity of these small particles forms part of each dose, otherwise the fumes will be generated too quickly, and scalding of the foliage will result.

Resin wash is an excellent spray for scale insects of citrus trees.

Summer Thinning.

Trees should still be watched, and this work carried out where necessary, as described in the numbers of the *Agricultural Gazette* for last October and December. One or two leaders in young pear trees especially will often shoot ahead during the latter part of the summer, and if not checked the remaining leaders in the tree will be sapped by them and a very uneven and difficult tree to manage will be the result.

Reworking Old Trees.

Worthless varieties can be budded over during this month to more valuable varieties. The budding wood should only be taken from trees that have borne consistent crops of high quality fruit. Where the trees that are to be reworked have been previously cut down in the early spring, the buds should be inserted in the young shoots that have shot out. There are often more of these shoots than are necessary, and some should have been removed earlier; but it is always wise to leave a bud more than will eventually be required for reforming the framework of the tree, as it often happens that some will be lost by winds and other accidents. Moreover, thick stumps will "callus" over more quickly when there is a shoot growing from both top and bottom edge of the cut. If it is not required one can be removed later, when the callus has grown well over the edges of the cut.

Where the old trees have not been cut back in the early spring it will generally be found easier to insert buds on the outer or underneath side of the old limbs, where the sap is flowing more freely. Buds so placed will also give a better shaped tree. But if it is possible to insert one bud on the upper side also it will help to heal a thick stump more quickly, as already described. If such a bud cannot be inserted, and should a shoot start when the tree is cut back in the following spring, to start the buds, it may be left to assist healing. It may be budded later for safety, but in any case it should be watched and checked if it should threaten to sap the bud inserted on the lower side of the limb.

Marketing Fruit.

Stone fruits should be picked on the firm side for market, as it is often some days after despatch from the orchard before the fruit is sold by the retailer. This is especially the case with fruit re-consigned to country fruiterers. All fruit should be graded to size and quality, and firmly packed. Wrapping paper is now so expensive that it will be used less frequently than usual, otherwise it might be tried for packing stone fruit in a season such as this to ascertain whether it would prevent the spread of brown rot from one fruit to another in the case. There is no doubt that wrapping ensures both stone and pome fruits carrying and opening up in better condition.

Drying.

The drying of apricots will be completed early this month, and in some districts the first of the suitable peaches will be fit towards the end.

Codlin Moth.

It may be necessary in some districts to give the late maturing apples and pears an extra spray with arsenate of lead this month. If an orchard should be badly infested, bandages of bag or similar material should be kept round the butts of the tree and examined regularly every week, and all larvæ found harbouring there destroyed. Any fruit that has been attacked should be picked from the tree and boiled or burnt, as well as any infested fruit that has fallen. By rigorous action for a season or two the pest can be reduced to a mimimum.

Preparation for Cover Crops.

Where it is intended to sow a cover crop next month or early in March, seed and manure should be ordered now, as if it is on hand it can be sown just at the most suitable time according to the season ; sometimes that means all the difference between success and failure of such a crop. Tares and field peas are useful legumes for this purpose in districts suited to them, but in some inland districts they are very uncertain crops, and rye (which is a cereal) has to be resorted to.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows ; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
Gosford and Brisbane Water A. and H. Association	O. F. Ash	Jan. 18, 19
Albion Park A., H., and I. Association	H. G. Fraser	,, 30, 31
Kiama Agricultural Association	G. A. Somerville	,, 25, 26
Berry Agricultural Association	A. McConaghy	Feb. 6, 7
Coramba District Agricultural Association	H. E. Hindmarsh	,, 13, 14
Central Cumberland A. and H. Assocn. (Castle Hill)	H. A. Best	,, 15, 16
Wyong Agricultural Association	W. Baldwin	,, 22, 23
Dapto A. and H. Society	J. J. Cook	,, 20, 21
Guyra P., A., and H. Association	P. N. Stevenson	,, 20, 21
Alstonville A. Society	C. D. McIntyre	,, 26, 27
Yanco Irrigation Area A. Society	F. E. Harrison	,, 26, 27
Bangalow A. and I. Society	W. H. Reading	,, 26, 27
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 26, 27, 28
Moruya A. and P. Society	H. P. Jeffery	,, 27, 28
Robertson A. and H. Association	R. Graham	,, 27, 28
Dorrigo and Guy Fawkes A. Association	R. R. Blair	,, 27, 28
Gunning P., A., and I. Society	S. A. Beer	,, 27, 28
Inverell P. and A. Association	J. T. Dale	,, 27, 28 ; March 1

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1918.

Society.	Secretary	Date.
Newcastle A., H., and I. Association	E. J. Dann	Feb. 27, 28; March 1, 2
Tenterfield P., A., and H. Society	R. G. White	Mar. 5, 6, 7
Tamworth P. and A. Association	J. R. Wood	,, 5, 6, 7
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 5, 6, 7
Bega A., P., and H. Society	H. J. B. Grime	,, 6, 7
Braidwood P., A., and H. Association	L. Chapman	,, 6, 7
Tumut A. and P. Association	T. E. Wilkinson	,, 6, 7
Bellinger River A. Association	J. F. Reynolds	,, 6, 7
Cooma P. and A. Association	C. J. Walmsley	,, 6, 7
Crookwell A., P., and H. Society	M. P. Levy	,, 7, 8
Berrima District A., H., and I. Society (Moss Vale)	J. W. Kenny	,, 7, 8, 9
Wollongong A., H., and I. Association	W. J. Cochrane	,, 7, 8, 9
Queanbeyan P. and A. Association	J. G. Harris	,, 12, 13
Glen Innes & Central New England P. & A. Assocn.	G. A. Priest	,, 12, 13, 14
Cobargo A., P., and H. Society	T. F. Kennelly	,, 13, 14
Bombala Exhibition Society	P. J. Jonas	,, 13, 14
Nambucca A. and H. Association	M. Wallace	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 13, 14
Camden A., H., and I. Society	A. E. Baldock	,, 13, 14, 15
Goulburn A., P., and H. Society	H. C. Fraser	,, 14, 15, 16
Armidale and New England P., A., and H. Assocn.	A. H. McArthur	,, 19, 20, 21, 22
Nimmitabel A. and P. Association	O. E. Silk	,, 20, 21
Gundagai P. and A. Society	C. D. Asprey	,, 20, 21
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 20, 21, 22
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 20, 21, 22
Delegate P. and A. Society	F. H. Mullane	,, 21
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 26—Apr. 3
Walcha P. and A. Association	S. Hargrave	,, 27, 28
Bathurst A., H., and P. Association	S. V. Turrell	April 10, 11, 12
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 10-13
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 17, 18
Clarence P. and A. Society (Grafton)	G. N. Small	,, 17, 18
Batlow Agricultural Society	C. S. Gregory	,, 23, 24
Dungog A. and H. Association	W. H. Green	,, 24, 25, 26
Dubbo P., A., and H. Association	F. Weston	May 1, 2
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 9, 10, 11
Corowa P., A., and H. Society	J. D. Fraser	Aug. 20, 21
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 27, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 3, 4
Grenfell P., A., and H. Association	G. Cousins	,, 3, 4
Temora P., A., H., and I. Association	A. D. Ness	,, 17, 18, 19
Yass P. and A. Association	E. A. Hickey	,, 26, 27

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Agricultural Gazette of New South Wales.

Water on the Farm.

[Continued from Vol. XXVIII, page 841.]

F. B. GUTHRIE.

Water for Irrigation.

The value of water for irrigating crops and orchards is of special importance in districts with low rainfall, and it is unfortunate that just in these districts the water is liable to contain injurious saline matter in solution; also, in these districts the temperature is high and the atmosphere dry. Evaporation is consequently excessive, thus bringing about the deposition of the injurious salts in the soil, and particularly at the surface, where their accumulation has the effect of corroding the stems of plants, as well as producing an injurious effect upon the soil itself, hardening it and hindering the natural movement of water which is essential for the healthy growth of plants.

The mean annual evaporation from a water-surface in districts in the western part of New South Wales, where the atmosphere is hot and dry, is more than double the mean annual rainfall in the same localities, and frequently three or four times as great.

At Dubbo, for example, the mean annual evaporation for seventeen years is 67·7 inches, as against a mean annual rainfall of 22·4 inches. In individual years, and particularly in years of drought, this discrepancy is much more marked. For example, the records from Walgett for 1902 show the total rainfall for that year to have been 6·74 inches, with an evaporation for the same period of 74·806 inches. The figures for the evaporation refer to the evaporation from a surface of water, not from the soil itself. The actual evaporation from the soil will vary according to the nature of the soil. The following figures, kindly supplied by the Meteorological Bureau, will give some idea of the general relation of evaporation to rainfall in the dry districts:—

Table giving Mean Annual Evaporation and Rainfall for Seventeen Years from various observing stations.

	Sydney.	Walgett.	Dubbo.	Hay.	Young.
	inches.	inches.	inches.	inches.	inches.
Mean annual evaporation for seventeen years.	36·74	62·51	67·67	38·94	44·61
Mean annual rainfall	48·08	18·62	22·37	14·07	25·16

No systematic records of the evaporation from grass and from bare earth are kept at the country recording centres, but such observations are made at the Sydney Observatory, and the following figures, taken from the records published for 1901 and 1902, which cover a period of severe drought, will serve to indicate the relationship existing between the evaporation from a water-surface and from the earth :—

	1901.	1902.
	inches.	inches.
Total evaporation from grass land	42·228	38·683
,, ,, bare earth	28·695	27·753
,, ,, water	38·098	35·632
Total rainfall	40·099	43·070

When the land is irrigated by water impregnated with saline matter, as is the case with the water obtained from bores or within the artesian area, the effect of this excessive evaporation is to charge the surface-soil with the salts originally in solution.

Injurious Salts in Irrigation Waters.

Of the impurities mentioned in a previous section as being liable to occur in different types of water, none are likely to prove injurious to crop growth except common salt, carbonate of soda, and, to a lesser degree, sulphate of soda.

The presence of the other saline substances, such as salts of lime, magnesia, potash, and ammonia, has, on the contrary, a definite value in providing plant food, and this is also the case with the organic matter. Neither is hardness of any disadvantage in a water to be used for irrigation, depending as it does on the presence of lime salts, which have a high fertilising value.

The presence of a high proportion of salts of magnesium is not desirable, since it has been found that when magnesium is present in the soil in much larger proportions than lime, the growth of ordinary crops is affected. The danger is, however, a remote one, as the magnesium content of our waters is generally low. Its presence in water which is to be used for stock is objectionable, as the soluble magnesium salts have a scouring action, which will be referred to later.

The presence of sulphuretted hydrogen is also objectionable. Such water should be stored so as to aerate it until the characteristic odour has disappeared.

The two constituents which exercise a definitely injurious action on crop production, and which are present unfortunately in all our artesian water and, to a lesser extent, in all the water obtainable in the dry districts, are sodium chloride (common salt) and sodium carbonate (alkali).

Common Salt (Sodium Chloride).

Common salt is a direct plant poison for nearly all crops if present in any quantity. There are certain plants which are salt lovers, such as saltbush, asparagus, and many of the plants growing by the sea, but if present in the soil in any quantity, salt produces absolute sterility. It is stated in most text-books that its presence in the soil in any quantity over $\frac{1}{10}$th per cent. renders the soil sterile.

This proportion is seldom reached under normal conditions, for common salt is an exceedingly soluble compound and passes away very readily in the drainage water, the soil particles having very little power of retaining it.

This accounts for the fact that artesian waters contain so large a proportion of sodium salts and only comparatively small quantities of potash, lime, and magnesia, although the rocks, to whose disintegration the saline matter in the water is due, contain more of these minerals than they do of soda. The salts of potash, lime, &c., are "fixed" and retained by the soil through which they pass, whereas the chloride and carbonate of soda remain in solution.

It is on this account very unusual to find, even near the sea-coast where the rain contains an appreciable quantity of chlorides, anything approaching the danger limit of $\frac{1}{10}$th per cent. in the soil, which represents about 1 ton of common salt per acre to a depth of 6 inches. In the case of the soils in the arid or semi-arid districts which we are considering, the matter assumes a different aspect. The high evaporation induced by the hot and dry atmospheric conditions causes the evaporation of the greater portion of the water applied to the soil, and the saline matter contained in the water is deposited in the surface soil, irrespective of its nature. The deposit left behind will have, under these circumstances, very much the same composition as the deposit left by simple evaporation of the original water, and the proportion of the salts will be much the same, there having been much less selective action than would be the case if the water had filtered, as in normal conditions, through a considerable layer of soil.

Carbonate of Soda (Alkali).

The action of carbonate of soda is less as a direct plant poison than as a corrosive. The deposit left on the surface on the evaporation of water containing carbonate of soda is alkaline in character, and burns the stems of plants or of young trees where it comes in contact with them. Besides this, it has a most injurious action on the texture of the soil itself, and particularly on the clay particles, which it deflocculates and converts into a slimy, sticky substance which, on drying, becomes a hard stony mass impervious to water. After prolonged action of alkali the soil is liable to become so hard that it is impossible to cultivate it; indeed, it requires breaking up with a pick or crowbar. In some parts of the world, notably in the United States, large tracts of country have been converted by the gradual accumulation of alkali into alkali deserts, which it has been possible to redeem only by a great expenditure of labour and money. We have, fortunately, no such alkali wastes in this country; but the continued use of alkali bore-water on undrained land, and without precautions for preventing too rapid surface evaporation, such as artificial draining or surface mulching, has resulted in a state of things which has frequently rendered continued cultivation impossible.

Limits of Toxic Effects.

It is not an easy matter to define exactly the composition of a water which must be regarded as likely to be injurious to plant life, so much depending, as we have seen, on the nature of the soil, its drainage—natural or artificial—

and the rate of surface evaporation. On deep sandy soils crops will tolerate a much larger proportion of salt and alkali than on clayey ones, stiff clays being particularly susceptible to alkali. The water of the Moree Bore contains about 50 parts carbonate of soda and 10 parts sodium chloride per 100,000, and this may be regarded as about the limit, as far as carbonate of soda is concerned, at which such water can be used with safety, unless precautions are taken to ensure thorough drainage and reduce evaporation. Even with this water, if used for any length of time, the land should be irrigated by channels and not flooded, and the surface soil should be kept well mulched by light harrowing after the water has been run on. On soil which is not too clayey, irrigation can be successfully carried on with such water. The waters from the different bores vary considerably in their alkali content, but rarely exceed about 70 parts per 100,000, and in the majority of cases the alkalinity lies between 30 and 70 parts per 100,000. The highest individual instance which has come under my notice was from a well at Boggabri, which had an alkalinity equivalent to 511 parts per 100,000, but this was quite exceptional.

The same variation is found in the content of sodium chloride. Of the artesian waters examined by the Mines Department, the highest salt content is 500 parts per 100,000, but only a few of the analyses published show more than 100 parts per 100,000, the great bulk of the artesian waters containing under 14 parts per 100,000.

There are, however, many exceptions, and we have examined waters from bores and deep wells, some of which show a higher percentage of common salt than is present in the water of the Pacific Ocean.

As in the case of carbonate of soda, any water containing appreciable quantities of common salt must be used with caution, and the same measures taken to prevent undue evaporation from the surface and consequent deposition of the salt. In the case of a water containing about 50 parts of carbonate of soda per 100,000, the proportion of common salt which can be used with safety, if the precautions specified be taken, is probably about 15 parts per 100,000. In the absence of carbonate of soda a larger proportion of common salt can be tolerated.

Variation in Composition of Bore Water at different depths.

It is frequently found that the water when first struck is surcharged with saline matter, but that when the bore has been flowing for some time, and especially when it has been deepened, the amount of salts in solution diminishes appreciably, and this is more particularly the case with the injurious salts we have been discussing, viz., carbonate of soda and common salt.

The exceptional figures for these constituents quoted above probably refer to the first flow, and it is to be expected that as the flow continues or the bore is deepened the water will become purer.

The following figures have been selected from the analyses of "Artesian and Sub-artesian Waters in New South Wales," by J. C. H. Mingaye, F.I.C., and H. P. White, published by the Department of Mines, and illustrate this point very clearly. Those analyses have been selected which show the actual depths at which the samples had been taken. In the case of the Morton Plains, the carbonate of soda has increased slightly at the lower depth, but the percentage of common salt has diminished enormously.

COMPOSITION of Waters from Bores at different depth.
Parts per 100,000.

Name of Bore.	Government or Private.	Depth in feet.	Carbonate of Soda.	Common Salt.
Boolooroo	G.	1,411	77·6	25·5
,, ...	,,	2,215	51·8	9·4
Bryanungra ...	P.	2,075	80·7	37·0
,, ...	,,	3,050	49·7	10·2
Cherrigorang ...	,,	1,558	52·4	5·1
,, ...	,,	2,030	34·0	2·25
,, ..	,,	2,062	32·7	2·25
Morton Plains ...	,,	750	42·0	51·0
,, ...	,,	1,658–1,668	49·0	9·9
Quambone No. 1 ...	,,	1,619	48·0	4·25
,, ,, ...	,,	1,760	39·7	2·8
,, ,, ...	,,	2,135	30·9	2·05

It is also of interest to note that this decrease of sodium carbonate and sodium chloride at the lower depths is usually accompanied by a slight increase in the quantities of carbonates of potash, lime, and magnesia. The percentages of these salts are, however, so small that the phenomenon is only of scientific interest.

A good example is afforded by some samples of water examined in the Laboratory of the Agricultural Department for Mr. F. S. Falkiner, Deniliquin, taken at different depths from a private bore on his property.

Water was struck first at a depth of 70 feet, which was very salt. At 143 feet a good supply was struck, but which was unsuitable for vegetation. The bore was deepened to 215 feet, when a good supply was reached, which was stated to be "mixed with fresh water and not bad for the garden." At 322 feet a supply was obtained which could keep a 3½ inch pump going, worked by 12-feet windmill. The nature of the water struck at these various depths is as follows (in parts per 100,000):—

Depth.	Carbonate of Soda.	Common Salt.	Total Solid residue.
143 feet	31·8	171·0	254·
215 ,, ...	10·6	112·6	142·
322 ,, ...	11·6	36·0	62·

The sample taken at 70 feet was not analysed.

(*To be continued.*)

Diseases of Tobacco Plants.

BLUE MOULD AND A BACTERIAL DISEASE.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

Blue Mould.

BLUE MOULD has long been a serious disease of tobacco plants in Victoria, and during the last two seasons it has wrought great havoc in New South Wales. It is due to a fungus, *Peronospora hyoscyami*, which is closely allied to the fungus causing Irish Blight in potatoes. It makes its appearance particularly in seasons when the rainfall is excessive. As in the case of most fungus diseases, a particular relationship must exist between the weather, the plant attacked, and the fungus before the latter can establish itself and spread with rapidity. Blue mould especially attacks young plants in the seed-bed ; and when the particular relationship above referred to exists, it spreads so rapidly that if it makes its appearance the whole seed-bed may be damaged in the course of a few days.

Spraying as a protective measure against the disease is practically out of the question for the following reason :—The leaves of the young tobacco plant are closely pressed against the smooth surface of the seed-bed, and it is on the *under* surface of these leaves that the fungus makes its appearance. A certain amount of moisture condenses on the under-surface of these leaves and aids in the rapid spread of the fungus. To the naked eye the underside of a diseased leaf appears to be covered with fluff with a faint violet tinge. This fluff consists of fungus threads which come out from the leaf and branch freely, each branch bearing at its extremity a small oval spore. These spores are produced in millions. Another kind of spore is produced within the tissues of the host plant. This spore is known as an oospore. It can remain dormant much longer than the other form of spore, hence the necessity for burning diseased plants. When it germinates it produces a germ tube which infects any adjacent plant. The fungus threads travel in the tissues of the young leaf, absorbing nourishment from it and causing it to wither rapidly and die. Attacked plants early lose their bright green colour, and a practised eye can quickly detect the change.

A large number of experiments have been carried out in Victoria by Mr. Temple A. J. Smith with a view to discovering means of preventing blue mould. They have been recorded in the *Victorian Journal of Agriculture.* Similar experiments have been carried out in America. None of these experiments, either by using sprays or by sterilizing the seed-bed, have proved very successful. The latter method appears to be scientifically sound. It is, however, one matter to sterilize a seed-bed but quite another matter to keep it sterile. Tobacco culture is largely in the hands of Chinese; their seed-beds are usually close to their planting-out grounds and adjacent to old seed-beds. Dust has only to be raised from infected ground by trampling horses or men, or tools, boots, or hands with infected earth adhering to them to be used when dealing with the young plants in the sterile seed-bed and all the previous sterilization goes for nought. Moreover, all the water used for watering must be sterilized. Similarly, if seed-beds are planted a long distance away from the planting-out grounds they will only remain immune from disease if every precaution is taken to keep infection away from them.

On a recent visit to Tamworth, in company with Mr. Tregenna, Tobacco Expert of the Department, the writer examined tobacco seed-beds on high land in virgin soil many miles from other tobacco-growing land. Yet the seedlings were attacked by blue mould. No trace of the fungus could be found there or elsewhere upon weeds likely to be attacked by blue mould and to carry infection. The beds were being worked by Chinese, and it seems probable that they had conveyed infection on their hands, boots, or implements when returning from visits to the infected gardens of their compatriots. It is not easy or indeed possible to convey to a Chinaman, whose knowledge of English is very limited, any real idea of the extraordinary precautions that must be taken to maintain sterility in a seed-bed; and even white men who did understand would have difficulty in maintaining complete sterility.

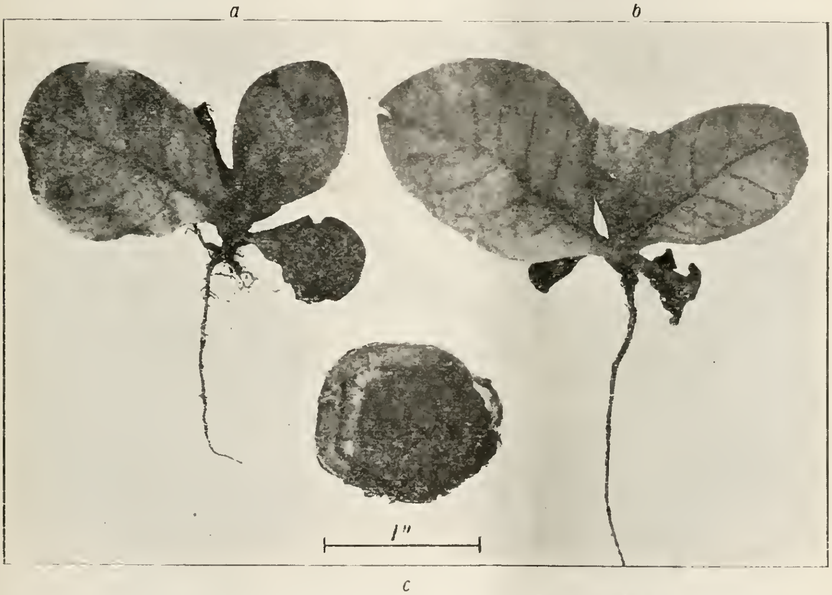

Fig. 1.—*a* and *b*. Two seedling tobacco plants attacked by Blue Mould. *c*. A transverse section of the diseased stem of a mature tobacco plant, on the left of which is seen the "brown ring."

The other alternative is to take advantage of the relationship that must exist between the weather, the tobacco plant, and the fungus before the latter can establish itself. The weather we cannot control, but we can take advantage of its variability. The tobacco plant we can aid to withstand attack by making it vigorous with suitable manure. The soundest practice therefore appears to be—(1) Prepare a number of seed-beds suitably manured, so that the young plants quickly establish themselves; (2) Sow these beds at intervals of two to three weeks; (3) Transplant at the earliest opportunity. If the disease makes its appearance in any one of the beds, spray it at once with strong Bordeaux mixture, not with the view of checking the disease but with the view to stamping it out before it establishes itself in epidemic form. The loss of the seedlings through the action of the strong Bordeaux mixture will not matter greatly since other beds will be coming on, which, with favourable weather conditions, will escape the disease. The point of development at which blue mould chiefly attacks the plants is in the seedling stage when they have from four to eight leaves. Two such plants

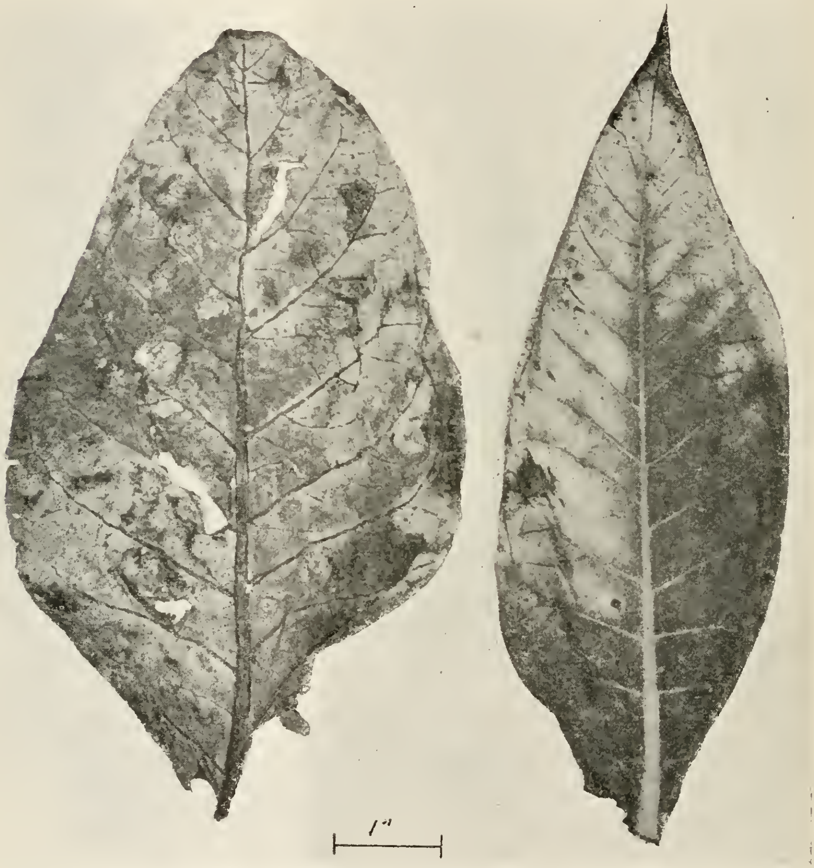

Fig. 2.—Leaves from a well-grown tobacco plant, showing various stages of wilting. The stem was diseased and showed the characteristic "brown ring."

that have been attacked are shown in Fig. 1, *a* and *b*. On older plants that have been transplanted to the field I have not often found the mould itself, though often they show spots and withering of the leaves, as shown in Fig. 2; this I am inclined to attribute to a different cause.

A Bacterial Disease of Tobacco.

Seedlings that have been attacked by blue mould may die out completely or they may exhibit a partial recovery, sufficient to induce the grower to transplant them. Such plants may grow in the field and completely recover, or they may attain a certain size and then wilt. They seldom have the appearance of normal healthy vigorous plants, and are very liable to develop brittle stems that break off in a very moderate breeze. The stems of all such plants when cut sharply across, just above the root, show a ring of sap-conducting tissue that is discoloured—it is brown or black. Cutting the stem across at intervals, this discoloured tissue may be traced upwards towards the apex. The colour becomes fainter, but it can be traced even with the naked eye into the veins of the big leaves. In the neighbourhood of this discoloured tissue I have found cells full of bacteria and have obtained cultures of them from various parts of the plant. They exist in such numbers that there seems good reason to suppose that they are the cause of the discoloration and the diseased condition. A tobacco plant has bast both inside and outside the ring of wood; in the neighbourhood of this bast the bacteria are very numerous. A section of a diseased stem showing part of the brown ring is shown at Fig. 1, *c*, on the left of the figure. The wood of the diseased stem snaps easily, and often shows little splits and cavities filled with a dark material. A plant affected by bacteria shows, when young, a peculiar appearance. The stem, immediately above the roots, swells and becomes tumid, sometimes almost bulbous. The stem may be abnormally swollen for two inches or more. If the plant remains short and swollen it is regarded as being worthless for planting out, but if, as sometimes happens, it begins to lengthen and lose its swollen appearance, it may be worth transplanting, though it never fully recovers. A plant showing the abnormal swelling is shown at Fig. 3, *a*, and one that is lengthening and recovering is shown at Fig. 3, *b*.

The certainty with which pure cultures of bacteria can be obtained from the plants leaves very little doubt but that bacteria are the main cause of the disease. The species is probably *Bacillus solanacearum.* This bacillus attacks potatoes, tomatoes, and tobacco, all plants belonging to the order *Solanaceæ.* I have found in several localities tomatoes suffering from a wilting disease, the stems of which were crowded with bacteria; and my assistant, Mr. Birmingham, has isolated from the base of diseased potato stems a bacillus which in cultural characters agrees with *B. solanacearum*, and upon various media (except milk) gives the reactions ascribed to *Bacillus solanacearum* by Dr. Erwin Smith, who has made a special study of this organism. This particular organism, therefore, probably exists in our soils. My view at present is that the wounds in the stem caused by the rotting leaves of the seedlings attacked by blue mould afford a means of entrance to the bacteria into the plant. If a series of sections be taken across young plants attacked by blue mould, a point or points will be found where a connection is visible between the decayed end of a leaf and the brown ring, previously referred to, in the stem. In some few roots I have found eelworms, but they have not been found sufficiently often to suggest that they make the wound through which the bacteria enter. Inoculation experiments will have to be carried out before it can be definitely asserted that the bacteria play the part I have attributed to them.

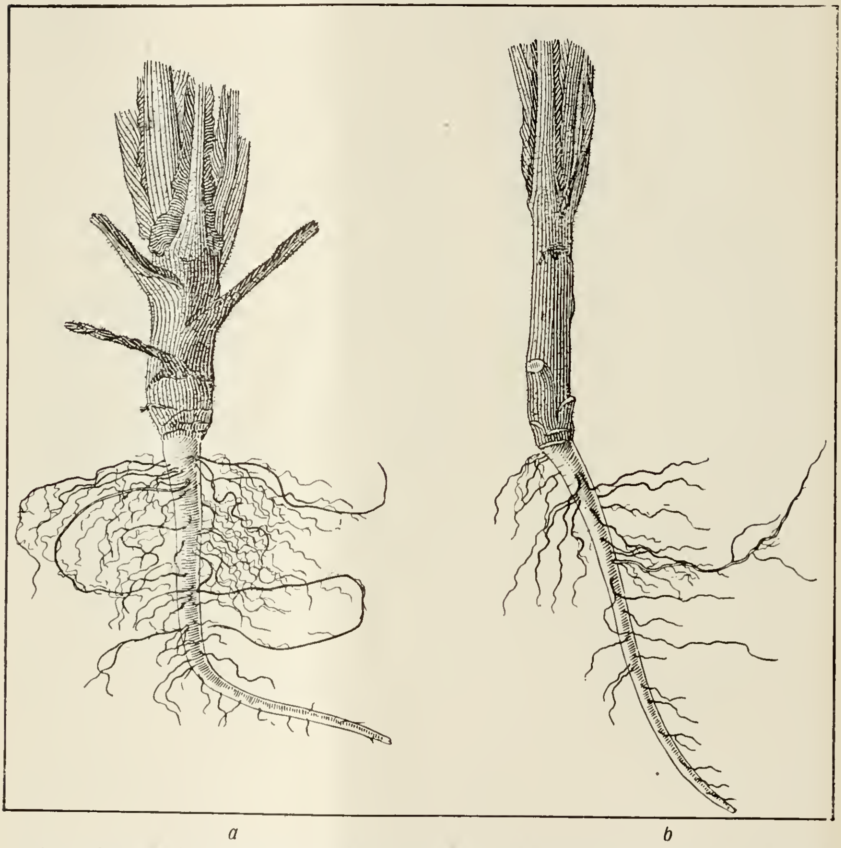

Fig. 3.—*a*. A young tobacco plant that is diseased showing the characteristic bulbous appearance at the base of the stem. *b* Young diseased tobacco plant which has started to lengthen and the bulbous swelling at the base is diminishing.

Wilt Diseases of Tobacco.

Dr. Erwin F. Smith* has written a most valuable account of the various wilt diseases of tobacco caused by bacteria, and the following extracts will be of interest to compare with the brief description of the Australian disease given above. The wilt diseases are often called slime diseases, because, in the advanced stages of the disease, the pith becomes brown and slimy.

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* Bacteria in Relation to Plant Diseases. Vol. III. Erwin F. Smith.

THE DUTCH EAST INDIAN DISEASE.—"This slime disease (according to Hunger) is caused by *Bacillus solanacearum.* The slime disease is a secondary phenomenon which is made possible by external wounds. The woundings may be due to many and very different causes. In the first place should be mentioned wounds due to plant and animal parasites. Among the first-named may be reckoned the parasitic moulds, especially *Phytophthora nicotianæ.*"

THE NORTH-AMERICAN DISEASE.—*Synonyms*: NORTH CAROLINA TOBACCO WILT; GRANVILLE TOBACCO WILT; FLORIDA WILT.—This disease has been especially studied by Dr. Erwin F. Smith, and determined to be due to *Bacillus solanacearum.* The plants he inoculated readily contracted the disease, going through the same progressive stages as plants obtained from the field. "The affected leaves developed pale-green spots, and then dried out very irregularly. Often the 'ears' died first. Sometimes the apex died first, or one margin or the leaf dried out irregularly. In all such cases vascular bundles at the base of the green midrib were browned and occupied by bacteria. Cavities were formed in the midrib of such leaves." As the result of his investigations, Dr. Smith concludes (1) that only sound plants should be set out, and to this end the seed-bed should be on soil free from this organism; (2) that seedlings should be transplanted early, and injured as little as possible in the removal; (3) that they should not be watered from infected wells, ponds, or streams; (4) that diseased plants should be removed from the fields as promptly as possible, so that they may not become centres of infection; (5) that the fingers or knives should not be used on sound plants after use on diseased plants without a preliminary sterilization; and, finally, (6) that, as far as practicable, badly-infested fields should be devoted to other and non-solanaceous crops. Tomatoes, peppers, potatoes, or egg plants must not follow the tobacco, nor should peanuts.

With recommendation (2) I am in hearty agreement; but as regards (6), most of our tobacco fields have been specially laid out for irrigation in particular districts, and much money has been expended on drying sheds. To devote the land to other crops would mean that much capital expenditure would not be bearing interest. Moreover, there is reason to think, as shown later, that *Bacillus solanacearum* lives long in the soil; hence to obtain soil free from it is difficult. The rooting out and destruction of diseased plants by fire, instead of leaving them in the waterways, will destroy countless numbers of virulent bacteria.

THE JAPANESE DISEASE.—A disease, variously known to the Japanese as "stem-rot," "blackleg," and "wilt disease," having many of the characters of Granville wilt, and in which the vascular system of the stem is brown and disorganised as in the Australian disease, has been attributed by Uyeda to an organism which he designated *Bacillus nicotianæ.*

THE SUMATRAN DISEASE.—No less than twelve papers have been published in Dutch on this disease by Dr. Honing. Dr. Smith has translated the papers and summarised them. They render it probable that both the Sumatran disease and the Japanese disease are, like the American disease, due to the one organism, *Bacillus solanacearum*.

Dr. Honing concludes that "although unquestionably the slime bacteria are killed off in the soil by other organisms (otherwise there would soon be nothing else in the soil), nevertheless the fact remains that they may persist in the soil for years. *Bacillus solanacearum* often loses its virulence quickly. Disinfections of the soil with chloride of lime and with potassium permanganate yielded no striking results.

In those cases where I have found serious bacterial disease in the stems of tomato plants, the soil has always been heavily watered or irrigated. Both here, and in tobacco lands elsewhere, deep ploughing with exposure to the sun would possibly materially aid disinfection. We may be dealing in this country with more than one wilt disease of solanaceous plants. I should therefore be grateful for any specimens of potato, tomato, or tobacco plants (stem and root) where the plants have shown a sudden wilting, in order to make an examination of them.

ELEPHANT OR NAPIER'S FODDER GRASS.

As the result of the offer made in an article on this grass in the July issue, various farmers on the coast have applied for cuttings and roots.

In response to an inquiry, Mr. M. S. Gunther, of Lane Cove road, North Ryde, supplied the following interesting notes:—

The attached summary shows the results on two neighbouring farms. I have not included my own horse, as he had eaten it readily once before after breaking into the enclosure:—

	Horses.		Cattle.	
	Pony.	Draught.	Heifer.	Cow.
Fed after daily ration	Yes.	Yes.	...	Yes.
Fed before daily ration	...	...	Yes.	...
Eaten up as readily	Yes.	Yes.	...	...
Eaten up only in admixture with bran	...	...	Yes.	..
Eaten up apparently more greedily ...	...	...	...	Yes
Stalks rejected	No.	No.	Yes.	No.
Dry leaves rejected (only sufficient for one test)	No.	...	...	..
Condition of stock fed..	Medium.	Medium.	Prime.	Fat.

The daily ration in each case consisted of lucerne, green and dry, also chaffed maize and bran. The grass, except for a few dry leaves, had been chaffed in each case.

Both the heifer and the cow were Jerseys. Some doubt had been expressed as to whether the former would touch it before feeding, but in each case it had been fed by the original attendant. Diameter of stalks fed, up to ⅞-inch; width of leaves, up to 1⅛ inch; height to tip of longest shoot from ground, 4¾ feet; average height of shoots, 3¾ feet.

Wagga Growing-crop Competition.

[The Murrumbidgee Pastoral and Agricultural Association, Wagga, again held a growing-crop competition, and, with the approval of the Minister of Agriculture, Mr. H. C. Stening, Inspector of Agriculture, acted as judge. The following extracts from the report furnished to the President and Committee of the Association by Mr. Stening are published for general information.—Ed.]

There were twenty-one entries, of which two were withdrawn prior to the time of judging.

As hay making was in full swing on Mr. Bicket's farm, it was decided to judge his crops on the 3rd November, but the judging in a general way did not commence until the 8th and was completed on the 16th, heavy rain being responsible for a delay of two days. The time of judging was later than usual, owing to the crops maturing late in consequence of the cool spring weather and moist soil conditions.

The total area inspected was 8,398 acres, ranging from 160 to 960 acres. The awards are as follows:—

Best farm of growing crops: W. J. Dennis, 142 points, 1; E. Field, 135 points, 2.

Best 100 acres of wheat to be harvested for grain, and to be grown on fallowed land: E. Field, 1.

Best 100 acres of wheat, grown for hay: W. J. Dennis, 1.

No great difficulty was experienced in allotting the first prize for the best farm of growing crops and also the prize for the best 100 acres of wheat grown for hay, as the crops on Mr. Dennis' farm were much superior to any others in the competition. They reflect great credit on the grower, who evidently has left no stone unturned to achieve success in the competitions, and incidentally to ensure the highest returns possible from his land. The varieties grown by Mr. Dennis are Warden, Zealand, and College Purple, and all are to be harvested for hay, of which very heavy yields will be produced; but judged from a grain-yielding standpoint they promise the high average yield of 27 bushels per acre. His crops also are very even, comparatively free from disease, and remarkably clean and free from undergrowth; only a few black oats were present in a gully, having gained entrance by means of flood water from adjacent farms. Mr. Dennis' success can be attributed mainly to thorough cultivation. The whole of the 220 acres of crop was grown on land fallowed in August and September. The fallow was cultivated with the spring-tooth cultivator twice and harrowed during the spring, and spring-toothed, disced, and harrowed in the autumn. Weed growth was also kept in check by the judicious use of sheep on the fallows. The seed was treated with formalin solution (1 lb. of formalin to 40 gallons water) in preference to the bluestone pickle, and a special fertiliser was applied, which is an admixture of superphosphate with a nitrogenous manure. Whether the latter was an advantage could not be judged, as there was no comparative test with superphosphate alone.

The second prize for the best farm of growing crops goes to Mr. E. Field, whose crops, with the exception of a small area, were grown on land fallowed early and well worked. One paddock contained a goodly sprinkling of black oats, and 10 acres of crop were badly affected with take-all, but these faults were present on almost all the farms in the competition. Mr. Field scored only two points more than Mr. Lewington, whose larger area of crop was cleaner, but a good proportion of it, which was situated on low-lying land, suffered from a superabundance of water.

The competition for the best 100 acres of wheat to be harvested for grain and to be grown on fallowed land was very close.

Mr. Field wins with a very clean and even crop of Federation, estimated to yield 26 bushels per acre. It is plainly evident that Mr. Field is exercising care in producing a crop true to type. Mr. Laity is runner-up with 100 acres consisting of 60 acres Yandilla King and 40 acres Brown Lammas, which scored only one point less than Mr. Field's crop.

The prize for the hay crop is awarded to Mr. Dennis' crop of Warden, which is very even, scrupulously clean and free from undergrowth, and estimated to return an average yield of about 55 cwt. per acre. Mr. Dennis' crops of College Purple and Zealand are expected to yield quite as well as the Warden, but the latter is " standing up " better, and is judged to be of better quality. It possesses a fine straw, green to the base, with very little flag, and should cut an excellent sample of chaff. If it were the intention to harvest this crop for grain, it would have been awarded the prize for grain crop, but as this provision will not be carried out it is not eligible for competition in the grain crop section.

Both Mr. Dennis and Mr. Field have been successful exhibitors in previous crop competitions, and are to be congratulated on the fresh honours gained in the present competition.

Apparent Yield.

Taken as a whole, the crops do not promise as high yields as those expected from the crops at this period of last year, although it is anticipated that the yields actually harvested will be better, for the crops are not of such rank, soft growth as last season's crops, and are expected to be better able to resist storms and rust attack. On examining the ears it is noticed that almost invariably the bottom four or five spikelets are not formed, probably the result of excessive moisture.

There are sufficient indications that the rainfall has been in excess of requirements for the production of high yields. For instance, the crop in the neighbourhood of trees, which in normal seasons usually suffers from lack of moisture, is this year heavier and carrying a better formed ear than the crop in the rest of the field. On low-lying land the crop has been "drowned," resulting in a poor stunted growth with a miserably small head. The " stands " of the majority of the crops inspected were rather thin, due to the destruction of seed by mice.

There is ample moisture in the soil, and the weather has been favourable for the production of plump grain, provided damage is not caused by rust.

Type.

In a general way the crops are reasonably pure, but in a few isolated instances there is evidence that there has been no attempt made to prevent an admixture of varieties at sowing time by removing the seed from the drill when changing from one variety to another.

Disease.

Evidently the season has been favourable for the development of fungous diseases. Rust is present in the crops on the flag and sheath, particularly so in the case of Federation, which is very susceptible to rust attack. In a couple of instances a trace of the fungus was discovered on the stem and ear, and the recent rains and muggy weather are favourable for its further development. It is probable that the condition of the crops will stand to them ; they are not nearly so soft and sappy as last season's crops, and will be enabled to resist the rust better. The majority of the crops are well advanced and will probably escape much damage, but late-sown crops of rust-liable varieties will in all probability suffer a reduction in yield.

As in the previous season, take-all is very prevalent, and is attacking the crops at a late stage and occasioning great loss. Some crops which promised high yields three weeks ago have been reduced to almost total failures, and the appearance of some fields after the disease has wrought its destruction leads one to the opinion that the fungus has been appropriately named. It was the general experience that crops on stubble land were very badly affected, while the extent of the damage caused by the disease to crop on fallowed land was so small that it was hardly worth mentioning. This serves to demonstrate that fallowing is effective in keeping the disease in check provided that the fallow is kept clean. Some of the native grasses will act as host-plants for the disease, and thus are a means of carrying the disease to subsequent crops. Some of the crops most affected were grown on land which had produced only one crop previously, and the disease frequently appears in paddocks which have been cropped for the first time ; this upsets the contention of some who hold that only crops growing on land that has been continuously cropped with wheat for many years are subject to take-all.

Many illustrations of the comparative immunity of oats to Take-all were noticed ; healthy crops of Algerian oats were seen growing in the same paddocks alongside wheat crops which were badly affected with the fungus, and lusty specimens of Algerian oats were observed growing in the centre of take-all patches in a wheat crop.

Flag-smut and loose-smut were present, but were not so prevalent as in the two preceding years. There was more bunt, otherwise known as stinking smut, encountered this year than in any previous competition that I have judged. It was detected on five different farms, and two crops may be classed as very smutty. In two instances it was due to sowing seed that was not pickled, and in the other cases the method of treatment must have been at fault.

DETAILS OF AWARDS, WAGGA GROWING-CROP COMPETITION, 1917.

Names and Addresses of Competitors.	Area of Crop.	Varieties.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Rainfall during growing period.	Number of Crops grown previously.	Apparent Yield.	Trueness to Type.	Freedom from defects and disease.	Evenness.	Cleanliness.	Cultivation.	Total Points.
	Ac.				lb.	lb.	Pts.		*	†	‡	§	‖	¶	
1. W. J. Dennis, "Havilah," Harefield.	220	Warden, College Purple, Zealand.	The whole fallowed in August and September, cultivated with spring-tooth twice, and harrowed before harvest; spring-toothed, disced, and harrowed before sowing.	April and May	50	60 lb. No. 10 special fertiliser.	1,675	6	27	18	19	19	29	30	142
2. E. Field, "Wave Hill," Marrar.	280	Federation, Currawa, Firbank, Warden, Algerian Oats.	231 acres fallowed July and August, disced, spring-toothed and harrowed. Balance stubble land.	April and May	50 wheat 40 oats, portions resown.	45	1,541	10 ac. 2nd crop; bal. over 6.	25½	18½	17	18½	26½	29	135
3. A. Lewington, "Texas Farm," Uranquinty.	490	Federation, College Purple, Marshall's No. 3, Currawa, Zealand, Yandilla King.	The whole fallowed July to October, spring-toothed in spring, disced, spring-toothed and spike-rolled before sowing; harrowed after drill.	April 12 to June 6	60	50	..	Very old land.	23	16	17½	18	28	29½	132
4. A. G. Jennings, "Raywood," Berry Jerry.	610	Federation, Warden, Sanger's Prolific, Currawa, Gluyas Early.	350 acres fallowed in spring, disced and spring-toothed before sowing; 53 acres stubble land ploughed. Balance stubble land scarified.	Mid-April to 1st June.	50	50 to 65	..	207 ac. 5th crop; balance over 20 crops	24½	17	16½	18	26½	26½	129
5. W. Lee, "Greendale," Uranquinty.	300	Federation, College Purple, Algerian Oats.	240 acres fallowed July to October, rolled and harrowed before harvest, disced in autumn, or cultivated, rolled, and harrowed. Balance ploughed autumn.	April 10 to May 24.	60	56	..	240 ac. 4th crop; bal. 5th crop.	25½	17	16	18	26½	25½	128½

Maximum Number of Points.. ..	*	†	‡	§	‖	¶
	1 point for every 1 bushel wheat. 1 " 1½ " oats. 1 , 1¼ " barley.	20	20	20	1st crop .. 24 2nd " .. 25 3rd " .. 26 4th " .. 27 5th " .. 28 6th " .. 29 Over 6 crops.. 30	1st crop .. 24 2nd " .. 25 3rd " .. 26 4th " .. 27 5th " .. 28 6th " .. 29 Over 6 crops.. 30

DETAILS OF AWARDS—*continued.*

Names and Addresses of Competitors.	Area of Crop.	Varieties.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Rainfall during growing period.	Number of Crops grown previously.	Apparent Yield.	Trueness to Type.	Freedom from defects and disease.	Evenness.	Cleanliness.	Cultivation.	Total Points.
	Ac.				lb.	lb.	Pts.		*	†	‡	§	‖	¶	
6. A. A. Wilson, "Lisgo," Old Junee.	345	Federation, Yandilla King, Firbank, Algerian Oats.	220 acres fallowed August and September, harrowed, spring-toothed, and disced. Balance stubble land ploughed, harrowed and harrowed after drill.	April 24 to end May.	55 wheat, 60 oats.	50 to 56	..	125 ac 2nd crop; bal. old land.	23½	17½	17	18	26	26½	128½
7. L. Bubb, "Dimboola," Mangoplah.	160	Yandilla King, Major Joffre, Marquis, Penny, Huron, Prelude, Banner Oats.	All but a few acres fallowed October, disced and spike-rolled.	May	45	50 to 55	..	125 ac. 6th crop; 10 ac. 2nd crop; bal. 1st crop	25	17	17	17½	24	26	126½
8. E. F. Hayes, "Haywood," Downside.	280	Federation, Marshall's No. 3, Currawa, Improved Steinwedel, Red Straw, Firbank, Algerian Oats.	200 acres fallowed July and August, harrowed and cross-harrowed in spring, disced March, spring-toothed before sowing. Balance stubble land, half of which was ploughed and half disced.	April 20 to June 7.	48 to 60 wheat, 40 oats.	35 to 50	..	68 ac. 1st crop, 34 ac. 4th crop; balance over 6.	22	17½	15½	18	26	26½	125½
9. W. F. Stone, "Springfield," Uranquinty.	360	Federation, Currawa, Marshall's No. 3, Red Lammas, Zealand, Dart's Imperial, Algerian Oats.	217 acres fallowed September, harrowed in spring, scarified twice, and harrowed in autumn. Balance ploughed in autumn, harrowed and scarified.	May and first week June.	56	45	..	Very old land.	20½	18	16	17	25½	28½	125½
10. J. Bicket, "Kyramba," Forest Hill.	682	Federation, Comeback, Zealand, Firbank, Warden, Canberra, Plover, Algerian Oats.	130 acres summer fallowed in January and February, and spring-toothed. Balance autumn ploughed and harrowed.	May to July..	60 to 75	25 to 70	1,410	70 ac. 4th crop; bal. over 6.	21½	18	17	17	25½	26	125

Maximum Number of Points .. ..

* 1 point for every 1 bushel wheat.
1 ,, 1½ ,, oats.
1 ,, 1¼ ,, barley.

† 20

‡ 20

§ 20

‖		¶	
1st crop ..	24	1st crop ..	24
2nd ,, ..	25	2nd ,, ..	25
3rd ,, ..	26	3rd ,, ..	26
4th ,, ..	27	4th ,, ..	27
5th ,, ..	28	5th ,, ..	28
6th ,, ..	29	6th ,, ..	29
Over 6 crops..	30	Over 6 crops..	30

DETAILS OF AWARDS—*continued.*

Names and Addresses of Competitors.	Area of Crop.	Varieties.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Rainfall during growing period.	Number of Crops grown previously.	Apparent Yield	Trueness to Type.	Freedom from defects and disease.	Evenness.	Cleanliness.	Cultivation.	Total Points.
	Ac.				lb.	lb.	Pts.		*	†	‡	§	‖	¶	
11. R. A. Laity, "Woodlands," Marrar.	240	Federation, Yandilla King, Brown Lammas, Firbank.	140 acres fallowed July and August, and disced. Balance stubble land ploughed and harrowed.	May	45 to 60	40 to 50	1,517	100 ac. 2nd crop; bal. over 6.	24	17	16	17	25½	25½	125
J. Gooden, "Sunnyside," Lake Albert.	650	Federation, Currawa, Commonwealth, Algerian Oats.	220 acres fallowed September and October, ploughed and harrowed. Balance stubble land ploughed.	April to end June.	50 to 56	56	..	220 ac. 2nd crop; bal. over 6.	22	17	17	18	24	25	123
13. A. Alleyn, "Fairview," Downside.	480	Federation, Improved Steinwedel, Algerian Oats.	340 acres fallowed June to September, and worked. Balance autumn ploughed.	April 20 to June 8.	45 to 60, 40 oats.	35 to 56	..	Over 6 ..	18	17½	15	17	25	28½	121
14. J. Ewart, "Kalimna," The Rock.	486	Federation, Steinwedel, Turvey, Firbank.	242 acres fallowed August and September, and worked. Balance stubble land ploughed.	May 10 to June 25.	45 to 60	30 to 45	..	242 ac. 4th crop; bal. 6th crop.	20½	16½	17	17	25½	24½	121
15. C. B. Good, Harefield.	245	Federation, Bunyip, Firbank, Hard Federation.	180 acres fallowed August to October, and disced. Balance stubble land, portion of which was ploughed and the rest disced.	May	50 to 60	30	..	65 ac. 2nd crop; bal. 6th crop.	18	17	16	17	26	26	120
16. G. L. Dicks, Marrar.	380	Federation, Yandilla King, Bunyip, Zealand.	212 acres fallowed August and September, and cultivated. Balance stubble land ploughed.	May to first week June.	40 to 60	35 to 40	..	212 ac. 1st crop; bal. over 6.	21	17	15	17½	24½	24½	119½

Maximum Number of Points..

*	†	‡	§	‖	¶
1 point for every 1 bushel wheat. 1 ,, 1½ ,, oats. 1 ,, 1¼ ,, barley.	20	20	20	1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops.. 30	1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops.. 30

DETAILS OF AWARDS—*continued.*

Names and Addresses of Competitors.	Area of Crop.	Varieties.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Rainfall during growing period.	Number of Crops grown previously.	Apparent Yield.	Trueness to Type.	Freedom from defects and disease.	Evenness.	Cleanliness.	Cultivation.	Total Points.
	Ac.				lb.	lb.	Pts.		*	†	‡	§	‖	¶	
17. C. G. Abbott, "Glencairn," Junee.	960	Federation, Zealand, Firbank, Yandilla King, Algerian Oats.	235 acres fallowed September and October, spring-toothed in spring and disced in autumn; 50 acres lea land ploughed; 425 acres stubble land ploughed. Balance stubble land disced.	April to end June.	50 to 75	30 to 35	1,980	60 ac. 1st crop, 40 ac. 2nd crop, 150 ac. 3rd crop, 130 ac. 4th crop, 80 ac. 5th crop, 400 ac. 6th crop. 100 ac. over 6.	18	17	15½	16½	25	24	116
18. W. R. Lyons, "Sackville," Forest Hill.	810	Federation, Yandilla King, Canberra, Hard Federation, Dart's Imperial.	390 acres fallowed July to October, spring-toothed, cross spring-toothed, harrowed, sown and harrowed; 40 acres lea land ploughed and harrowed; 120 acres stubble land ploughed. Balance stubble land disced.	April to June	60 to 70	56	..	10 ac. 2nd crop; bal. old land.	13	16½	18	17	22	26	113
19. J. McEwen, "Ewin Vale," Marrar.	420	Federation, Firbank, Yandilla King.	285 acres fallowed August and September, harrowed twice, disced and harrowed. Balance stubble land ploughed and harrowed.	May and June	45 to 65	55 to 60	..	70 ac. 2nd crop, 65 ac. 4th crop; bal. over 6.	16	17½	15	17	21	26	112½

Maximum Number of Points ..

*	†	‡	§	‖	¶
1 point for every 1 bushel wheat. 1 „ 1½ „ oats. 1 „ 1¼ „ barley.	20	20	20	1st crop .. 24 2nd „ .. 25 3rd „ .. 26 4th „ .. 27 5th „ .. 28 6th „ .. 29 Over 6 crops .. 30	1st crop .. 24 2nd „ .. 25 3rd „ .. 26 4th „ .. 27 5th „ .. 28 6th „ .. 29 Over 6 crops .. 30

Cleanliness.

The crops generally were badly infested with black oats, only three or four farms being reasonably free from this pest. This may be attributed to the prolific seeding last season and to the favourable conditions for the germination of the seed this year. It was thought that the mice which invaded the paddocks after last harvest would have destroyed the seed of the black oats, but apparently there was much seed which escaped the attention of the rodents.

In some instances the crop on fallowed land was infested with black oats, due no doubt to the fact that the continuous rains last spring prevented cultivation of the fallows when it was desired to destroy weed growth.

Cultivation Methods.

More than half the total area of crop inspected was grown on fallowed land, while in the case of two entries the whole of the crop was sown on well-worked fallow ; these were the cleanest crops in the competition, and were comparatively free from take-all.

Even with such an abundant rainfall as has been experienced this season, the crops on fallow are much superior to those grown on stubble land, and the experience that some farmers have had with black oats and take-all should induce them to adopt the practice more generally. Too frequently land described as fallow is simply ploughed up and left until seeding time. Unless the fallow is cultivated to prevent the escape of the conserved moisture it is of very little value. On one farm a strip of uncultivated fallow was observed alongside cultivated fallow, and the difference in the growth of the crops was most marked, the crop on the cultivated fallow being estimated to yield at least 6 bushels more than that on the neglected fallow.

SALE OF HOLSTEIN AND OTHER CATTLE FROM BERRY EXPERIMENT FARM.

THE Department has arranged with Messrs. Morton and Wright, 3 Castlereagh-street, Sydney, to conduct an auction sale of fourteen Holstein cows, six bulls, and seven heifers from the Berry Experiment Farm. The sale will take place at the Berry Sale Yards on Tuesday, 19th March, 1918, at 2 p.m. Any prospective buyers who intend inspecting the cattle before the sale are advised to travel by the evening train from Sydney on 18th March.

Full particulars of pedigrees and any other information required can be obtained from the Under Secretary and Director, Department of Agriculture, Sydney, or from the Auctioneers.

Erratum.—On page 54 of the January issue the date of calving of Melba VII was given as 25th October. This should have been printed as 25th November.

Milling Tests of Wheat.

G. W. NORRIS, Chemist's Branch.

At the Wheat Conference held on 17th and 18th January, 1917, at which the Managers of the Experiment Farms and Inspectors of Agriculture were present, it was decided that tests for milling strength should be made of the chief varieties of wheat grown at the Experiment Farms and on the Farmers' Experiment Plots.

Glen Innes Experiment Farm.

Six samples were submitted by the Manager, consisting of Canberra, Cedar, Florence, Genoa, Haynes' Blue-stem, and Thew. The reports are as follows:—

CANBERRA.

Appearance of grain—Dark amber, semi-translucent, long, large, plump, soft.
Weight (lb. per bushel)—63·3.
Ease of milling—Fair to mill.
Percentage of mill products—Flour, 67·5; pollard, 14·9; bran, 17·6.
Nature of flour—Colour very good, rather white; strength, 44; percentage of dry gluten, 8·36; character of wet gluten—slight yellow colour, elastic, coherent, soft.

Notes.—This is a wheat of fine appearance, and usually produces a high percentage of good quality flour. The low yield is due to the tendency of the flour to cling to the bran. This defect is also noticeable with three other wheats in this batch, viz., Genoa, Thew, and Cedar, and is probably due to the season.

CEDAR.

Appearance of grain—Dark red, hard, long, fairly plump.
Weight (lb. per bushel)—64¾.
Ease of milling—Fair to mill.
Percentage of mill products—Flour, 68·3; pollard, 13·5; bran, 18·2.
Nature of flour.—Colour good, rather dark; strength, 52·6; percentage of dry gluten, 13·8; character of wet gluten—elastic, tough, dark yellow, fairly coherent.

Notes.—Bran not very clean, somewhat thick; pollard clean. The colour of the flour is darker than is usual with this variety, but in other respects it is highly satisfactory. The gluten expansion was very marked, rising considerably higher than any of the glutens in this batch.

FLORENCE.

Appearance of grain—Translucent, dark amber, plump, large, hard.
Weight (lb. per bushel)—64.
Ease of milling—Fair to mill.
Percentage of mill products—Flour, 72·1; pollard, 13·1; bran, 14·8.
Nature of flour—Colour excellent; strength, 46·0; percentage of dry gluten, 10·9: character of wet gluten—yellow colour, coherent, elastic, soft.

Notes.—A wheat of good appearance, and behaves well in the mill. It yields readily a high percentage of flour. The quality of the flour is very satisfactory, the colour being first-rate; good gluten content and strength.

GENOA.

Appearance of grain—Dark amber, semi-translucent, plump, fairly hard.
Weight (lb. per bushel)—62·6.
Ease of milling—Fair to mill.
Percentage of mill products—Flour, 68·2; pollard, 16·3; bran, 15·5.
Nature of flour—Colour very good; strength, 45·4; percentage of dry gluten, 11·1; character of wet gluten—slight yellow, elastic, coherent, soft.

Notes.—A wheat of good appearance, producing a somewhat low yield of flour. The flour is rich in gluten; colour and strength both satisfactory.

HAYNES' BLUE-STEM.

Appearance of grain—Translucent, dark red, plump, hard, medium size.
Weight (lb. per bushel)—63·1.
Ease of milling—Fair to mill.
Percentage of mill products—Flour, 71·0 ; pollard, 13·5 ; bran, 15·5.
Nature of flour—Colour excellent ; strength, 50 ; percentage of dry gluten, 12·8 ; character of wet gluten—slight yellow colour, tough, elastic, slightly coherent.

Notes.—A very attractive looking sample, and behaves well in the mill. The quality of the flour has improved, the strength being higher than is usual with this wheat. It is probably the best strain of Haynes' Blue-stem that has passed through the mill.

THEW.

Appearance of grain—Dark and light amber, semi-translucent, fairly plump, medium size, fairly hard.
Weight (lb. per bushel)—62.
Ease of milling—Fair to mill.
Percentage of mill products—Flour, 69·4 ; pollard, 13·3 ; bran, 17·3.
Nature of flour—Colour low ; strength, 46·6 ; percentage of dry gluten, 11·9 ; character of wet gluten—yellow colour, elastic, soft.

Notes.—The colour of the flour is very unsatisfactory, which is unusual with this variety. However, the gluten-content and strength are up to standard.

Wagga Experiment Farm.

Eleven samples were submitted by the Manager, consisting of Bunyip, Canberra, Comeback, Federation, Firbank, Hard Federation, Huguenot, Marshall's No. 3, Rymer, Yandilla King, and Zealand, but only five (Bunyip, Canberra, Comeback, Firbank, and Marshall's No. 3) could be milled, the rest being so badly weathered that a milling test would be misleading. The adverse weather conditions did not affect the hard varieties to any appreciable extent, while the deterioration is very marked with the softer varieties. The reports are as follows :—

BUNYIP.

Appearance of grain—Dark amber, medium hard and soft, pinched.
Weight (lb. per bushel)—60·1.
Ease of milling—Easy to mill.
Percentage of mill products—Flour, 73·2 ; pollard, 12·3 ; bran, 14·5.
Nature of flour—Colour excellent ; strength, 45·2 ; percentage of dry gluten, 12·2 ; character of wet gluten—coherent, elastic, soft, yellow colour.

Notes.—A good milling wheat, producing a large percentage of excellent coloured flour, rich in gluten, and of fair strength.

CANBERRA.

Appearance of grain—Dark amber, plump, soft, medium size.
Weight (lb. per bushel)—61·7.
Ease of milling—Easy to mill
Percentage of mill products—Flour, 74·5 ; pollard, 11·8 ; bran, 13·7.
Nature of flour—Colour good ; strength, 44·0 ; percentage of dry gluten, 11·1 ; character of wet gluten—bright yellow, coherent, soft, elastic.

Notes.—A good milling wheat of fine appearance, yielding a very high percentage of flour, rich in gluten, fair strength, and good colour.

COMEBACK.

Appearance of grain—Good, hard, plump, dull white, slightly weathered.
Weight (lb. per bushel) 60·7.
Ease of milling—Fair to mill.
Percentage of mill products—Flour, 73·7 ; pollard, 10·9 ; bran, 15·4.
Nature of flour—Colour fair ; strength, 52·6 ; percentage of dry gluten, 12·2 ; character of wet gluten—elastic, coherent, tough, slight yellow colour.

Notes.—This wheat has produced a flour of excellent quality, which is usual with this type of wheat.

FIRBANK.

Appearance of grain—Light amber, large, oaty, plump, soft.
Weight (lb per bushel)—60·4.
Ease of milling—Easy to mill.
Percentage of mill products—Flour, 73·7 ; pollard, 11·3 ; bran, 15·0.
Nature of flour—Colour excellent ; strength, 43·0 ; percentage of dry gluten, 10·3 ; character of wet gluten—slight yellow colour, elastic, coherent, soft.

Notes.—A satisfactory milling wheat, yielding a large percentage of excellent coloured flour. The strength is somewhat low, but gluten content satisfactory.

MARSHALL'S No. 3.

Appearance of grain—Dull white, soft, large, fairly plump.
Weight (lb. per bushel)—60·9.
Ease of milling—Easy to mill.
Percentage of mill products—Flour, 71·4 ; pollard, 12·7 ; bran, 15·9.
Nature of flour—Colour very good, slightly starchy ; strength, 42·4 ; percentage of dry gluten, 7·5 ; character of wet gluten—fair yellow colour, slightly elastic, soft.

Notes.—Although Marshall's No. 3 is, as a rule, a good milling wheat, the sample submitted has given a flour which should prove unsatisfactory in actual baking. This is shown by the low strength and small gluten content of the sample.

Wellington District Farmers' Experiment Plot.

Samples of wheat grown on the Farmers' Experiment Plot, situated on the property of Mr. D. A. Rich, Rozelayne, Wellington, were submitted through the local Assistant Inspector of Agriculture, Mr. R. G. May. Only four—Canberra, Hard Federation, Major, and Warden—were suitable for milling. The reports are as follows :—

CANBERRA.

Appearance of grain—Translucent, dark and light amber, plump, medium size.
Weight (lb. per bushel)—61·8.
Ease of milling—Easy to mill.
Percentage of mill products—Flour, 73·5 ; pollard, 10·6 ; bran, 15·9.
Nature of flour—Colour good ; strength, 43.2 ; percentage of dry gluten, 9·2 ; character of wet gluten—yellow colour, coherent, elastic, soft.

Notes.—This sample has a mottled appearance ; it is very floury, but the quality is not quite up to its usual standard. The gluten content is satisfactory, but the water absorption rather low.

HARD FEDERATION.

Appearance of grain—Translucent, dark amber, round, plump, hard.
Weight (lb. per bushel)—62·1.
Ease of milling—Fair to mill.
Percentage of mill products—Flour, 70·0 ; pollard, 14·8 ; bran, 15·2.
Nature of flour—Colour, excellent ; strength, 51·5 ; percentage of dry gluten, 10·1 ; character of wet gluten—yellow, coherent, elastic, soft.

Notes.—This wheat has produced a satisfactory yield of flour, which has an excellent colour, rich in gluten, and very high strength.

As a miller's wheat, this is undoubtedly the best of those forwarded from the Wellington district.

MAJOR.

Appearance of grain—Small, pale amber, soft, fairly plump.
Weight (lb. per bushel)—60·4.
Ease of milling—Easy to mill.
Percentage of mill products—Flour, 72·2 ; pollard, 13·2 ; bran, 14·6.
Nature of flour—Colour good ; strength, 42·8 ; percentage of dry gluten, 7·7 ; character of wet gluten—yellow colour, soft, coherent, elastic.

Notes.—This wheat has a fair appearance, and yields a large percentage of flour. The flour has a good colour, but the strength and gluten content are low.

WARDEN.

Appearance of grain—Brown, opaque, long, thin, soft, plump.
Weight (lb. per bushel)—61·5.
Ease of milling—Fair to mill.
Percentage of mill products—Flour, 69·0 ; pollard, 16·6 ; bran, 14·4.
Nature of flour—Colour fair, rather starchy ; strength, 42·6 ; percentage of dry gluten, 8·3 ; character of wet gluten—faint yellow colour, soft, elastic, coherent.

Notes.—This is not an attractive-looking sample on account of the colour and shape of the grain.

The flour has a tendency to cling to the bran, and consequently the yield has been affected. The quality of the flour is not satisfactory, the strength being low, and the gluten content poor.

(To be continued.)

A WHEAT STORAGE PROBLEM : PROTECTION FROM WEEVILS.

THE problems affecting wheat storage, or as it might be more accurately described, wheat preservation, are of extreme urgency in view of the prospect of a serious shortage in the food supply of the world as one of the results of the war, and it is obviously a matter of exceptional importance to prevent, as far as possible, the destruction and loss of grain in store through the ravages of pests.

Recognising this, the British Government asked the Royal Society of London to arrange an investigation into the damage done by insects to grain in store throughout the Empire.

The Executive Committee of the Commonwealth Advisory Council of Science and Industry received, through the Prime Minister's Department, in October, 1916, a request from the Royal Society that a committee should be appointed in Australia to co-operate with similar committees in England and Canada in this investigation. Reports were obtained from the Government Entomologists of each State, and it was shown that considerable losses were caused annually in Australia from grain weevils and other pests. The Executive Committee thereupon appointed a special committee to make further investigations.

This special committee included Mr. Leo Rossell, representing the milling industry, Professor W. A. Haswell, F.R.S., Professor of Zoology in the University of Sydney, and Mr. W. W. Froggatt, F.L.S., Government Entomologist, New South Wales. Mr. F. B. Guthrie, Chemist to the Department of Agriculture of New South Wales, subsequently joined the committee. The progress report prepared by this special committee has now been published in Bulletin 5 of the Advisory Council, and can be obtained post free from the Secretary, 314 Albert-street, East Melbourne. The report indicates that only the two grain weevils (*Calandra granaria* and *C. oryzæ*) demand special measures on account of their destructive effects on stored grain, that the development of weevils in wheat and their increase in number may be checked by not using old bags which may be weevil-infested, or storing in buildings likewise infested, and that bags of weevil-infested wheat should not be brought into contact or near that which is sound, for before wheat can become infested there must be a female to lay her eggs in the grains of wheat It is only when the perfect insect, after going through the various stages of its larval existence, emerges through a tiny hole in the grain that the damage is evident, and except during the pupating state destruction is going on during the whole life of the insect. Under suitable conditions it takes from nineteen to twenty-two days from the egg to the adult beetle ; and in three months, in one experiment, forty weevils produced 3,056 descendants. Under the present system of handling wheat the destruction of weevil, once it has gained access to the bagged grain, seems hopeless ; many methods of fumigating grain have been tried, and so far the most effective is that of poisoning with the fumes of carbon dioxide, but with bagged wheat this is not applicable, save at a prohibitive cost.

Sun-dried wheat contains only 4·7 per cent. of moisture. Neither in this, nor in wheat as it emerges from the thresher with a moisture content up to 6·7 per cent., will weevils breed. With 8 per cent. of moisture they died in six weeks without breeding, at 9 per cent. they remained dormant, but with anything above the latter, provided they had free air, they became active and bred. It would thus appear that dry wheat stored in air-tight bins is immune from the attack of weevils. Wheat when first bagged does not, under ordinary circumstances, contain sufficient moisture to enable weevils to breed, therefore, *unless moisture is added from without*, the grain remains weevil-proof. Thus if stored in a fairly dry climate, completely protected from the weather, it is certain that wheat may be stored for an indefinite period without any damage from weevils.

Farmers' Experiment Plots.

GREEN WINTER FODDER EXPERIMENTS, 1917.

Lower North Coast.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

THE season under review has been one of the driest during the autumn and winter which has been experienced for many years on the coast. Winter fodder plots were established at Tinonee, Comboyne, Yarramalong, and Picton, and with the exception of the Tinonee plot none made satisfactory growth until the good rains came in September. The growth at Tinonee was exceptionally good when the rainfall is considered, some of the early wheat attaining a height of 5 feet, with only 28 points of rain after planting. The illustration shows the plot of Firbank wheat grown under these conditions.

Green Fodder Experiments at Tinonee

A Plot of Firbank Wheat, 5 feet high, which had only 28 points of rain after planting.

The Tinonee Plot.

This plot was sown on 28th April on the farm of Mr. R. Richardson, and the germination was good throughout. In the early growth Firbank, Warren, and Florence looked best, while Thew did not appear so good. John Brown and Huguenot appeared to be distinctly poorer than all the other varieties, having a yellowish unhealthy colour. The peas and vetches planted with Huguenot wheat were making good growth in spite of the dry weather. Later on John Brown developed rust on the leaves, no sign of the disease being observable in any of the other varieties. During the third week in August observations showed that the early wheats still maintained their lead, and Florence, Firbank, and Thew were well in ear and about 3 to 3½ feet high. The oats and the Cleveland wheat had made very poor growth in comparison, and clearly showed that they were inferior to the early wheat during the dry spell that was being experienced at this stage, while the peas seemed to be making better growth than the vetches. Up to 12th September only 28 points of rain had fallen on the plots since planting, and by this time Florence, Firbank, Thew, and Warren were cut. At this stage the Sunrise oats also appeared to be much better than Algerian or Ruakura. After this date more than 10 inches of rain fell before the other varieties were cut, so that they had a very decided advantage and cannot be legitimately compared with the early varieties which were cut before this rain fell. The remaining plots were cut in the following order as they matured:—Ruakura and Sunrise oats, Huguenot, John Brown, Cleveland wheat, Algerian oats, the last-named being cut on 11th October. John Brown again proved its worthlessness as compared with the other varieties of wheat, not only on account of its low yield, but also in its susceptibility to rust. Cleveland wheat, tried for the first time in the coastal plots, turned out well in actual yield, and was very free from rust, although it did not look well in its early growth, and would apparently have yielded poorly if the dry weather had continued.

Owing to the unequal distribution of rainfall on the plots, as already indicated, the yields of the earlier cut wheats are shown separately as follows:—

Variety.	Yield of green fodder per acre.	
	tons	cwt.
Warren	7	12
Florence	6	16
Firbank	6	0
Thew	4	13½

The oats and the later varieties of wheat, which had the benefit of 10 or more inches of rain, weighed as follows:—

Variety.	Yield of green fodder per acre.	
	tons	cwt.
Sunrise oats	15	17
Algerian oats	13	9
Cleveland wheat..	13	6¼
Huguenot and field peas	12	3½
Huguenot and vetches	12	2
Huguenot...	11	3¼
Ruakura oats	10	18½
John Brown	8	4¾

The Comboyne Plot.

This plot was sown on 21st May on the farm of Mr. G. Brown. Owing to the dry state of the ground, a poor germination resulted until rain fell a few weeks later, when the remainder came up. The stand, on the whole, however, was not as thick as desirable. Owing to dry and unusually cold weather during the winter, the plots made very little growth, and were not more than 6 inches high at the beginning of July. It is during this month and August that green fodder is usually required most, and with this object sowing should take place on the Comboyne in early March. The sowing of this plot was unavoidably delayed, but the results obtained may be some indication of the most promising varieties.

Although Algerian oats proved to be the best yielding plot, the conditions were entirely favorable to the late varieties, as the early ones had very little rain before heading. Florence did not do well on that account, and the same cause is also responsible for the low yield of Thew. Of the oats, Guyra turned out satisfactorily. It is a new oat of the Department's breeding, which is recommended for the New England district. It is not as late as Algerian, and stools abundantly. Ruakura and Sunrise attracted much attention on account of their much greater earliness than Algerian, and also the former on account of its abundant stooling and heavy seed-bearing capacity. A lot of seed has been saved from the plot, and it is likely to be a popular variety in the district. All the oats were fairly free from rust. A substantial increase was obtained from the use of 1 cwt. superphosphate per acre on Thew wheat.

Following are the yields:—

Variety.	Yield of green fodder per acre.	
	tons	cwt.
Algerian oats	6	5¼
Guyra oats	6	1
Sunrise oats	5	12¼
Ruakura oats	5	8
Cleveland wheat...	4	10¾
Thew (1 cwt. superphosphate per acre) ...	4	3
Huguenot	3	15¼
Thew (no manure)	3	9
Florence	3	5¾

The Yarramalong Plot.

This plot was sown on 7th May on the farm of Mr. R. T. Beaven, and, as in the case of the Tinonee plot, it received practically no rain until the early varieties had headed. The growth, however, was far inferior to that at Tinonee because of the poorer soil. The stand was somewhat thin, and very poor growth was made during the winter months. Before the rain came in September Florence appeared to be the best variety; indeed, it bids to be a rival of Thew for green feed or hay on the coast. It is somewhat earlier, and usually escapes rust—at least as well as Thew. The yields are poor, owing to the dry season.

Variety.	Yield of green fodder per acre.	
	tons	cwt.
Huguenot and vetches	5	5
Huguenot	4	16¼
Huguenot and field peas	4	7½
Thew	4	4
Florence	3	17
John Brown	3	4¾
Warren	3	3
Firbank	3	1¼

The Picton Plot.

This plot was sown on the farm of Mr. L. Nicholson, Maldon, on 30th April, on the ordinary upland soil of the district, which is a heavy clay. On account of the almost entire absence of rain between April and September the plot was a failure; most of the wheat came into head when a foot or so high, and not being deemed worth cutting, the cattle were turned in without recording the weights.

Conclusions.

In many districts on the coast where green winter fodder is grown, it is still thought that no other crop is possible but Algerian oats. Many opinions have had to be reversed, after experience with the early varieties of wheat, such as Thew, Florence, and Firbank, which largely escape rust in most seasons, and which, besides being fit to cut a month or so earlier than Algerian oats, have been found to be better suited to the drier winters, such as have been experienced on the coast during the last few years. Two other varieties of oats, Sunrise and Ruakura, have also lately come into prominence, and bid fair to rival, if not surpass, Algerian, on account of their earlier maturity, rust resistance, and yield. The former variety, Sunrise, is not suitable for hay, owing to its coarse stems. This character is not a defect, however, when the succulent green growth is fed. It is a poor stooler, and the best results have been obtained from sowing it at a heavier rate than usual—broadcasting as much as 3 bushels per acre. The growth of this variety makes it a very suitable one for companion cropping with clover, field peas, or vetches, which do not get a good chance with profusely stooling varieties of wheat or oats. It also has the advantage of maturing uniformly with these crops, so that they can both be cut at the most desirable stage. Indeed, it would appear that this nurse or companion cropping of legumes like peas and vetches with green winter fodders (wheat and oats) is not adopted in practice as much as it should be. Apart from the fact that a better ration is obtained, it is being repeatedly shown where these legumes have been included in the winter fodders on the coast, that much better maize crops are grown after them, and that this benefit is apparent in the succeeding crops for two or three years.

Red Clover and its Varieties.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

Red clover has been cultivated in Europe as a fodder plant for about 400 years, and it now plays a considerable part in agriculture in Europe, America, New Zealand, and, to a less extent, in Australia. It is a plant that is known practically to every dairyman. It belongs to the legume family, and has the typical three-leafed character. The leaves and stems are hairy, although the hairiness varies in different species. The flowers are reddish-purple, with sheathing leaves at the base; after flowering the petals turn brown.

There are many varieties, or, more correctly speaking, strains of this clover, some authorities recognising as many as thirty. They are mostly named after the regions where they have been raised, and no distinct difference can be noticed in the structure of the various forms, with the exception of one characteristic in the stem structure. The ordinary Cow Grass and Perennial Red clovers from New Zealand have solid stems, while the stems of the American strains, such as Giant Hybrid and Broad Red, are hollow.

Although resembling each other in botanical structure, the different strains of red clover vary in important cultural characteristics, such as duration and quantity of foliage produced. As a rule, red clover is spoken of as a short-lived perennial; but this term is somewhat misleading, as the permanence of the plant depends partly on climatic conditions and partly on the manner in which it is cut or fed off. Experiments in this State have shown that with a climate like that of Glen Innes, individual red clover plants will last, under moderate grazing conditions, for four or five years, while in districts with dry summers the life of the plant is limited to two years or even less. Allowing the plants to run to seed is usually detrimental, often resulting in the death of the plant.

The maintenance of a clover pasture is generally dependent on the production of self-sown plants, and consequently on the setting of the seed. This has hitherto been assumed to be mostly dependent on the bumble-bee, which is not to be found in this State.

The long-lived clover pastures of New Zealand are attributable mostly to the presence there of large numbers of bumble-bees, which ensure cross-pollination of the flowers and thus enable the seed to set. An attempt was made to introduce the bumble-bee into this State some years ago, but it was not successful.

It has been known for some time in this State, however, that clover plants do set seed in the absence of the bumble-bee, and special attention has been devoted to this during the past two years. At Yanco Experiment Farm it was found that in twenty heads of flowers collected, upwards of 80 per cent. of the maximum number of flowers had set seed. At Glen Innes Experiment Farm last season a plot of Chilian clover, one twenty-fifth of an acre in extent, produced 10 lb. of seed, or at the rate of 250 lb. per acre. When it is considered that 100 to 200 lb. of seed per acre is the estimate in any clover-growing country, we must conclude that at any rate the Chilian strain of red clover not only sets seed, but sets it to the fullest possible amount. As regards the insects visiting the plants, Italian bees in abundance visit the clover pastures, while at Yanco Experiment Farm ants and butterflies were common. If red clover can set its seed in this manner, its cultivation must increase immensely. Pastures lasting many years are common in New Zealand, the result of the harrowing in of the seed dropped by the plants from time to time. The Manager of Glen Innes Experiment Farm has previously reported the production of seedlings by this method, and other private instances are probably obtainable.

Varieties of Red Clover grown in New South Wales.

The varieties or strains of red clover that have been grown in this State from time to time are as follows:—Cow Grass clover, Giant Hybrid Red clover, Broad Red clover, Perennial Red clover, American Red clover, and Chilian Red clover.

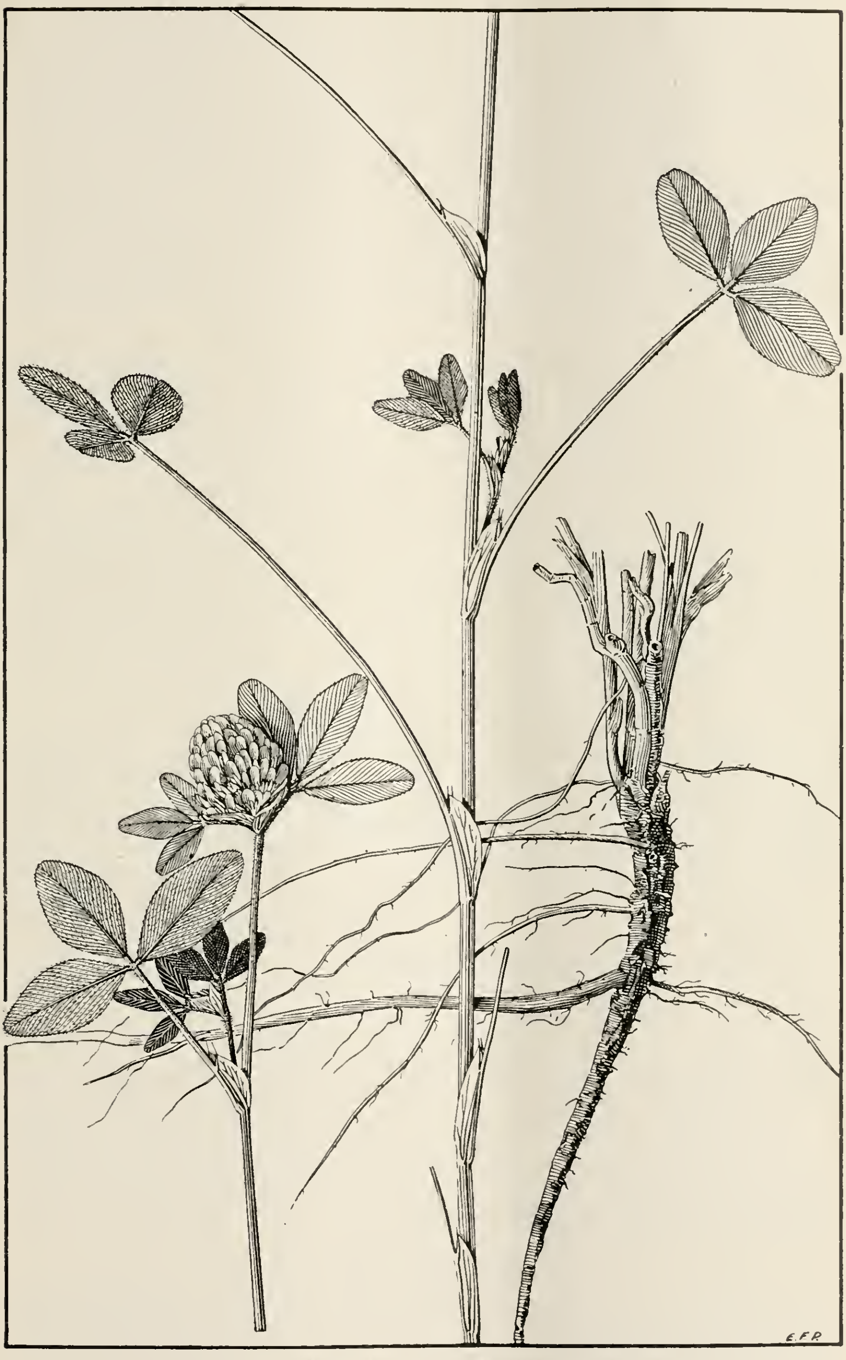
The most widely grown in New South Wales are Perennial Red clover and Cow Grass, the seed of which is mostly imported from New Zealand. There is no doubt that the climatic conditions of the coast and more elevated tablelands favour the development of clovers, and some fine stands can be seen in New England and on the coastal river flats, especially on the South Coast.

The ideal soil for red clover is a deep loam or alluvial, containing a fair amount of clay. The soil must be well drained, and should never become waterlogged. Such soils are fairly common in New South Wales, and clover-growing in such situations should be a paying proposition, even when the pasture or crop lasts only two or three years. Red clovers will not endure sandy soils, unless a fair amount of humus can be worked into them.

The value of red clover is threefold, viz., (1) as a hay crop; (2) as a pasture (either alone or in combination with grasses); and (3) as a rotation crop.

Clover Hay.

The excellence of clover hay is generally recognised. It is particularly valuable on account of its high protein content, so essential for the formation of muscle. It is important, however, that the clover should be cut at the right stage in order to obtain the maximum amount from it. The best time to cut is just before the first blossoms begin to turn brown. The longer the clover is left after blooming the less valuable it becomes as fodder, and the more indigestible. The curing of the hay requires special attention. If the cut clover is left standing in the sun for any time during the hot summer



Chilian Red Clover, showing leaf, flower, and root-structure.

RED CLOVER AND ITS VARIETIES.

temperatures, such as we have, the leaves become extremely brittle and the hay depreciates in value in consequence. If possible, it should be cured in the shade during the first stages, and before the leaves become quite dry it should be raked into windrows. Under ordinary summer conditions eighteen to twenty-four hours is a sufficiently long period for it to remain in the field. A little sweating in the stack should cause no alarm.

The yields of clover hay in this State compare favourably with those in other parts of the world. Whereas the average yield in the United States is estimated at 1 ton to 1¼ tons, yields of 30 cwt. to the acre have been common at Glen Innes Experiment Farm; while a crop of Chilian clover at the same institution went over 4 tons to the acre.

Red Clover as a Pasture.

It is a common practice in this State to mix red clover with English grasses, such as cocksfoot, rye and timothy. The clover in such a pasture usually does well, and the whole provides an excellent mixed ration for dairy stock. Experiments at Glen Innes also show that clover sown with wheat does very well, the clover acting as a pasture after the wheat has been removed. If sown and pastured alone there is a considerable amount of risk that bloat or hoven will occur. It has been proved that when fed on clovers and grasses cattle are less liable to hoven than when fed on clover alone. The hairiness of clover is also somewhat of a drawback, and the formation of hairballs is by no means uncommon.

Red Clover as a Rotation Crop.

The value of clover as a rotation crop has been unquestionably proved at the Rothamsted Experiment Station in England, and also in many parts of America. It is due (1) to the manufacture of nitrogen by the bacteria on the roots, with the subsequent formation of nitrogenous compounds, which enrich the soil; and (2) to the humus derived from the stem and leaf.

Maize, oats, wheat and clover form a common rotation in America. It has been found by experiment in one locality that the nitrogen content of the soil is preserved if red clover is grown for two years in a five years' rotation. This, of course, is not always applicable, but it is quoted as showing the value of clovers on any soils deficient in nitrogen. A rotation that is recommended for New England is wheat for one or two years, rape and clover. Clover is used as a rotation crop at Glen Innes Experiment Farm.

The continual growing of clover will sometimes cause the land to become clover-sick, owing to the heavy demands made by the crop on the phosphates and potash in the soil; such deficiencies can be made good by the application of the corresponding fertilisers.

Chilian Red Clover.

Of all the clovers grown at the different experiment farms and in farmers' experiment plots, none has done so well as Chilian clover. Its success is not confined to one locality, but is general.

It was first introduced by the Principal of Hawkesbury Agricultural College, and tried on the light soils of that institution. The success of the trial (recorded in the *Agricultural Gazette*) led to further experiments, viz., at Glen Innes, Yanco, Grafton and Bathurst Experiment Farms, and in farmers' experiment plots at Milton and Pambula; in all these localities it has done better than any strain previously tried.

Its principal characteristics are its permanence, its drought and frost-resisting properties, and the large quantity of fodder produced. A yield of 4 tons 5 cwt. of hay to the acre was obtained from the Chilian clover plot at Glen Innes Experiment Farm in 1916. The plot at Hawkesbury Agricultural College has now lasted for nearly three years; it consists partly of the original plants and partly of self-sown plants. The capacity of the strain to set seed, which has already been commented on, is noticeable in every locality. In the farmers' experiment plots at Milton and Pambula, the Chilian clover plot has now been in existence for three years, and is still perfect. Owing to war conditions, the difficulty of obtaining seed from Chilian sources is somewhat great, but there appears no doubt that when normal conditions are resumed the area under this clover will rapidly increase. A supply of acclimatised seed is gradually being built up by the Department.

Sowing.

Red clover seed should be sown in early autumn, viz., in March or April. If sown alone, it should be at the rate of 10 to 12 lb. per acre, but if sown with grasses 2 lb. per acre should suffice. The clover seed should be sown in a direction at right angles to that of the grasses. The seed should not be covered to a greater depth than 1 or 1½ inches, and a firm seed-bed is preferable. Some of the seed, due to hard seed-coats, will be delayed in germination. Such hard seed seems practically absent in acclimatised Chilian clover, as the vitality of the seed in seven days was shown to be over 90 per cent.

BAITED WIRES FOR FLIES.

THE British Museum (National History), of South Kensington, London, recommends the use of baited wires as a means of keeping down the house fly.

The mixture consists of castor oil 4 liquid oz, crushed resin 9½ oz.; or linseed oil 4 liquid oz., crushed resin 7½ oz. Heat the oil and then stir in the resin. Paint the mixture on wires about a yard in length; leave a hand-hold at one end unpainted, hook the other, and hang vertically from the hooked top. When covered with flies pass the wire through a flame to clear it of the used mixture and dead flies; heat fresh mixture and paint the wires as before.

Weeds of New South Wales.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

The "Wild Onion," or "Sweet-scented Garlic"
(*Allium fragrans* Vent.).

I do not know who will step forward and claim the honour of the introduction of this neat little, white-flowering liliaceous plant, which blooms regularly in a number of places in the coast districts every November. It was originally introduced into the State as an ornamental plant, and so, if it could be kept within bounds, it still would be, but where it has broken bounds it becomes a serious pest. To give an idea of its seriousness, there is no doubt that it is the most formidable weed in the Botanic Gardens at Sydney, being even worse than the nut-grass (*Cyperus rotundus*). I suppose I am within the mark when I say it costs £100 a year to keep it in check in that one establishment, which, at 4 per cent., represents a capital sum of £2,500. This estimate was originally made in 1897, twenty years ago, and although we have battled with it in a crowded garden, amongst so many subjects which cannot be removed, the figures are probably true now, in view of the fact that the area of the Botanic Gardens has greatly increased in the interval. It is more insidious than the nut-grass, because it is more brittle. It seems as if a perfect plant grows from every fragment left in the ground. I direct attention to it in the most serious manner.

Vernacular Names.—It is commonly known as "Onion" or "Wild Onion" about Sydney. "Sweet-scented Garlic" is a name sometimes given to it, because it is allied to garlic, while the flowers are slightly perfumed. It is not to be confused with *Bulbine bulbosa,* the well-known "Wild Onion," although in grassland, before flowering, the plants are not very dissimilar.

Botanical Name.—*Allium,* Latin for garlic; stated to be derived from a Celtic root *all,* hot or pungent; *fragrans,* Latin adjective, meaning fragrant or perfumed.

Botanical Description.—

Leaves a foot long, weak, diffuse, glaucous, linear, channelled, obtuse, and twisted at the end.

Scape smooth, erect, round, a little longer than the leaves, glaucous, with a little red at the base.

Umbel.—As many as sixteen-flowered in some umbels, with a short, scarious, two-leaved spatha.

Pedicels long, slender, rigid.

Flowers very fragrant, six-cleft, turbinate, with white, spreading, blunt, equal, concave segments, and a green tube.

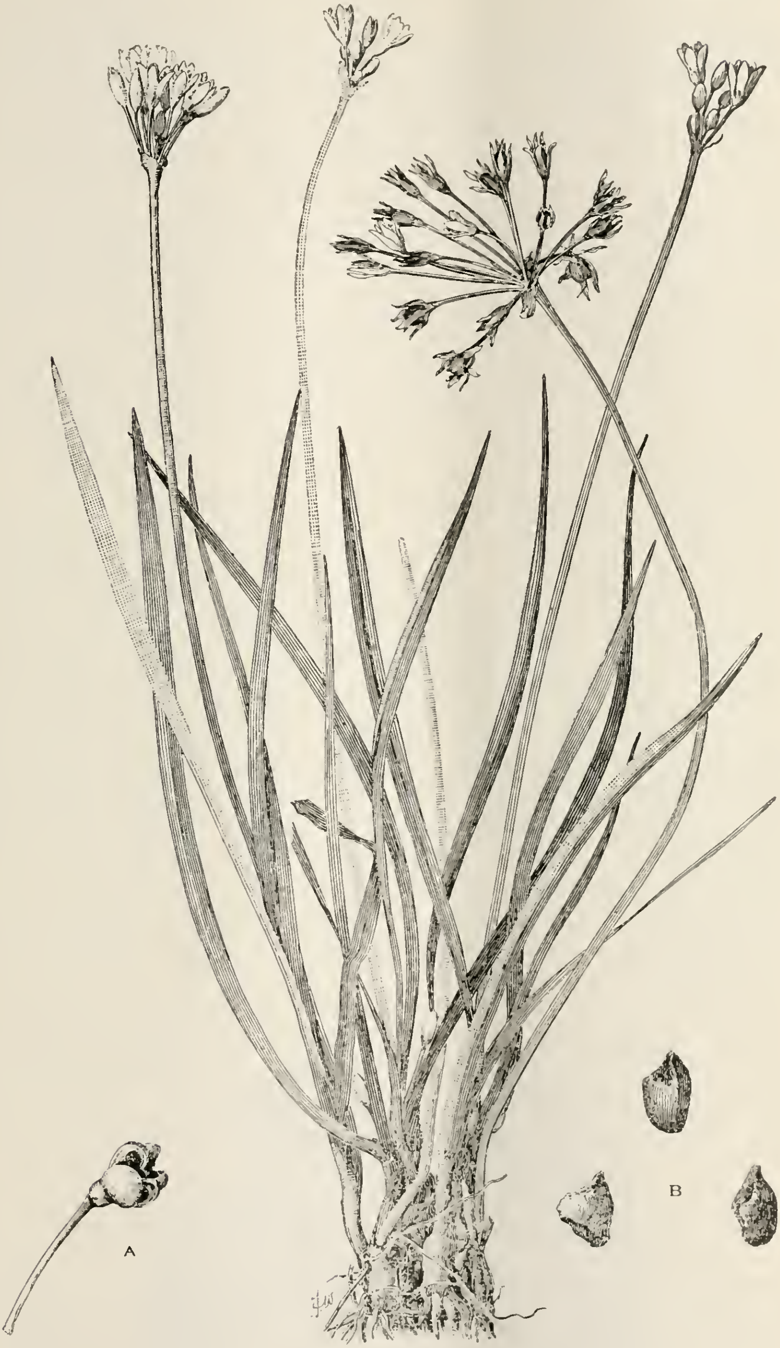
Stamens (six) nearly the length of the perianth, erect, inserted into the mouth of the tube.

Filaments linear lanceolate, white, green at base.

Pollen yellow. *Ovary* cylindrical, six-ribbed, very smooth.

Style the length of stamens. *Stigma* small, simple, depressed.

The above description is taken from *Edwards' Botanical Register*, vol. xi, p. 898, *Allium fragrans*, var. *nepalense*, except that the number of flowers in the umbel of our plants is as many as sixteen in contradistinction to six in the typical variety.



"Wild Onion," or "Sweet-scented Garlic" (*Allium fragrans* Vent.)

A—Fruit (slightly enlarged). B—Seeds (magnified)

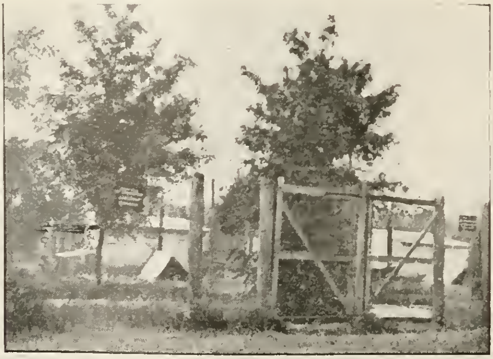
WEEDS OF NEW SOUTH WALES.

How to get rid of it.—In an ordinary garden-border perhaps the best method is to dig each plant up very gingerly, so as to be careful to take up every fragment. In lawns (where it spreads like infection) frequent mowing is the only cure, while on hard ground it should be shaved off close to the ground as often as it makes its appearance, with the result that it will eventually die out; but above all be on the look-out for it, and tackle it on its first appearance on a lawn or in a garden. Endeavour to recognise it, and then give it no quarter. When it has got a thorough hold on the ground it is almost impossible to get rid of it. Never let it flower if possible. The usual sulphate of ammonia treatment of a lawn is useful in dealing with Wild Onion, but the method is too laborious and expensive except in pleasure lawns. In garden-paths (and these are very often important sources of infection) the usual sodium arsenite treatment is most efficacious; indeed it has been proved that, wherever it can be applied, arsenic is the most certain agent for the destruction of weeds available to the cultivator. Obviously arsenic cannot be applied to the soil of a garden, or to a lawn.

A Congener.—Attention may be invited to a close relation of our pest, viz., *Allium vineale* Linn., which is such a terrible pest in many parts of the Southern United States. I trust that, by taking *A. fragrans* in time it will never become such a pest as *A. vineale* is to many American farmers and orchardists. This is the subject of a special bulletin (No. 2, vol. viii, July, 1895) of the Agricultural Experiment Station of the University of Tennessee. It is considered by many to be "the vilest weed pest in our State." Equally serious reports are made from New Jersey, Maryland, Virginia, North Carolina, South Carolina, and Georgia. In Texas its place is taken by *Allium striatum.* The most serious complaint against it is that "it ruins our milk, butter, and beef"; a danger may, though to a less intense degree, be looming before us as regards *A. fragrans.*

Where Found.—South Europe and North Africa, from whence it has spread to most warm countries.

In our State it prefers good soil, fairly moist, hence low-lying, rich alluvial soils, but it is very accommodating in this respect.



Poisoning Green Timber with Sodium Arsenite.

C. W. BURROWS, Field Assistant.

[Since the first article under this heading appeared in September, 1915, a considerable amount of work in connection with the varying quantities of washing soda and caustic soda in dissolving arsenic has been carried out. A modification of the formula has, in consequence, been made.]

In this country, where large areas of land are available for occupation, and are heavily timbered, it is of primary importance to remove the timber, either wholly or in part, in order to increase the productivity of the land, and the quickest methods are usually the best.

Ordinary ringbarking is effective if done at the right time for that particular district, for it must be conceded that seasons vary considerably from year to year, making the operation an adjustable one. But ordinary ringbarking has one disadvantage—it is slow, often taking twelve to eighteen months before the trees can be burnt off.

Of late years, the action of arsenic has been introduced with marked success in hastening the killing by the ringbarking process, and trees that ordinarily would take months to kill by the old method, are now killed in a few weeks, and frequently in a few days, by the application of arsenic.

Arsenic—the ordinary white arsenious oxide of commerce—is not soluble in water to any great extent, so that soda, either the ordinary washing soda or caustic soda, has to be used to dissolve it. When large amounts of the solution are required, washing soda will be the cheaper, but for small quantities of solution, caustic soda will possibly be found the handiest.

When preparing the solution, whether caustic soda or washing soda is used, first dissolve the soda in a convenient amount of water, using heat, if desirable, to assist and hasten it; then slowly add the arsenic, previously made into a thin paste (as the housewife treats her cornflour), stirring all the time; place on a strong fire, and after it has come to the boil, allow it to remain boiling for at least half an hour; stir from time to time, and be careful to stand on the side away from the fumes, as being poisonous they are apt to cause sickness. When the arsenic is thoroughly dissolved, the solution may be made up to the required bulk by adding the remainder of the water, either hot or cold.

A useful strength for quick and effective work in all kinds of timber is as follows:—Arsenic, 1 lb.; washing soda, 1 lb., or caustic soda, ½ lb.; water, 4 gallons; whiting, ½ lb. The addition of this whiting is merely that it may serve as an indicator on trees treated, as it turns white on slightly drying, making it quite certain what trees have been operated on. An empty kerosene tin makes a useful measure for dissolving in, as it holds 4 gallons.

The time to carry out the work of poisoning is when the tree is dormant—that is, when the sap movement is at its minimum and the sap right down in the roots and lower portions of the trunk. This occurs in the winter months, from, say, March to July, according to the district, and must necessarily vary between these limits in a State like New South Wales, which embraces such a wide variation of climate. On parts of the North Coast ringbarking has been carried out to the best advantage as late as June and early July in certain years, whereas in the more central parts of the State late February and March have found the sap movements at their lowest.

The main object in catching the sap to season is to prevent suckering. Trees can be killed by arsenic or ringbarking at practically any time of the year, but to prevent this suckering it is highly important to operate when the sap is down, or just completing its downward course.

Having decided on the season and dissolved the poison, we are ready to "frill" the trees. By "frilling" is meant a succession of downward axe cuts completely round the tree, each cut well overlapping the adjoining ones, so as to leave no unsevered section of bark up which the sap can flow. There is no doubt that "frilling" alone would kill timber if allowed time, but the poison does it in a fraction of the time; in fact, trees have been killed in a few days. These cuts must be through the bark and well into the wood proper, and as close down to the ground level as is convenient to cut them consistent with the shape of the tree, say, from 6 to 10 inches up.

For trees of 4 feet diameter, about a quart of solution is poured into this frilling, right round the tree, using an old teapot or kettle, as the spout makes pouring easy, and less is wasted by spilling needlessly round about. Smaller trees naturally need less solution. Saplings may be cut off low down, and with a swab-stick the solution may be dabbed on to kill and prevent suckering.

It is very important that this frilling and the applying of the poison be consistently and thoroughly carried out,. and not in any way scamped or slummed, if good results are to be looked for.

There need be no fear about stock being poisoned by eating the fallen or dead leaves from poisoned trees; for when it is considered the comparatively small quantity of solution used, the likelihood of the leaves absorbing any free arsenic is very remote. Nor is there much danger from stock grazing on areas frilled and poisoned, though it would be desirable to keep all stock off for three or four weeks, when all possible chance of danger would have disappeared.

No estimate of cost can be given, as this will necessarily depend upon so many factors which vary with each particular area.

Although arsenite of soda is obtainable as such from drug merchants, its use in that form cannot be recommended for the poisoning of green timber, as it is most irregular in its arsenic content.

Owing to the war, prices for arsenic, caustic soda, and washing soda are at present high and are constantly altering, so that it would be of little use to farmers to quote them here. It is therefore advised that when a considerable area is to be treated, one or other of the wholesale chemists should be written to and quotations obtained.

The Partial Neutralisation of Acidity in Cream.

M. A. O'CALLAGHAN AND A. A. RAMSAY.

INDEPENDENTLY we have published articles dealing with this subject, but as a great deal of the work was done conjointly, and as the subject deserved much closer investigation, it was decided to carry out further experiments, and collaborate fully.

The subject has assumed great importance of late owing to the difficulty in procuring sodium bicarbonate at anything like normal rates. There is, as will be seen, no reason why factory managers should go to the expense of purchasing sodium bicarbonate at the present almost prohibitive rates; in addition, the more imported matter we can do without the better, owing to the shortage of freight from abroad.

Before going into details it will be well to give an outline of how the position stood at the commencement of these experiments.

In 1909, when holding a short Dairy Science School at Bega, one of us (M.A.O'C.) demonstrated the use of ordinary lime for the purpose of neutralising cream prior to pasteurisation. This was done, not so much for the purpose of demonstrating the neutralisation of cream, but rather for the purpose of showing how a cream that was badly contaminated with injurious bacteria could be improved, even though the cream was too acid to be pasteurised in the ordinary way. The cream used was badly affected with a variety of the colon species, and had an extremely objectionable odour. By neutralising this cream with lime, pasteurising it immediately afterwards, and then adding a pure culture of lactic acid, a cream was obtained which showed a very great improvement on that prior to treatment At this time the question of using neutralisation in a commercial manner was not considered, at least not in Australasia; nor did we think then that the authorities controlling health matters throughout the world generally would approve of remedial measures of this kind in connection with cream. However, the United States and New Zealand, countries in which the supply of privately-separated cream was causing a good deal of anxiety, adopted the practice of neutralising the excessive acid in cream before pasteurisation, and this paved the way for us with the health authorities. The private separator was not generally adopted in New Zealand to the same extent as it is in New South Wales, hence the supply of the cream to the factories was not nearly so well organised as it is in this State. Consequently, extraordinary steps had to be taken to improve the cream supplied to factories in some way, in order to produce a butter suitable for table purposes; hence the urgency of neutralisation was greater there than in New South Wales.

At this period, a well-known gentleman connected with factory management in New Zealand came to New South Wales to study the system here, and discussed with one of us (M.A.O'C.) the possibilities of neutralisation. It was suggested to him that lime would be the most suitable alkali for his purpose known at the time, but he favoured sodium bicarbonate, and, we understand, made a success of pasteurisation, using this substance as a neutralising agent.

The choice of lime was mainly with a view to adding nothing to which health authorities might take exception. Another factor that weighed was the greater desirability of lime compared with soda when the buttermilk was to be used for pig or calf food. Sodium bicarbonate was, however, generally adopted in New Zealand as the neutralising agent best suited for the purpose of reducing the acidity in cream, and later this system spread to New South Wales and to other Australian States.

Generally speaking, the New South Wales factory managers have been using sodium bicarbonate—and with a good deal of success—as a neutralising agent. In almost every case, however—when the butter is freshly made—there is a definite soda flavour noticeable; and though this disappears in time and with cold storage, the flavour referred to must be regarded as a defect. The flavour of the butter when lime is used, however, is, as far as is possible to determine, not affected in any way with a foreign taste.

Experiments carried out at Albion Park factory in 1914, details of which were published in the *Agricultural Gazette* of May, 1915, went to show that lime was to be slightly preferred to soda, as far as may be judged by the resulting flavour of the butter. As carbonate of lime, however, is practically insoluble both in water and cream, it cannot be successfully used for neutralisation purposes unless the cream is kept constantly stirred in the neutralising vats preparatory to pasteurisation.

This success with carbonate of lime caused us to try ordinary lime (CaO). This latter mixes so readily with water that none of the defects of carbonate are present. For bad creams, however, it is probable that a carbonate would have an advantage, as then carbonic acid (CO_2) would be formed, and would cause a much greater aeration of the cream than occurs when quicklime (CaO) is used. Our experiments have been with cream of a quality not lower than what would be termed "medium," say worth 37 points for flavour out of 50, and as we should not produce, or have to treat, a cream of a lower quality than this, the use of lime (CaO), owing to its efficiency and cheapness, was, therefore, to be recommended unless there were other factors which would go towards making it unsuitable.

Probably a distinct advantage which lime possesses over soda is the fact that the addition of a little extra lime to butter consumed by children will give it an advantage, as the absence of lime in most of our drinking waters is more or less a national defect.

A Difficulty in the Use of Lime.

During the summer of 1916 some experiments were carried out by us, at different factories, in connection with lime as a neutralising agent, and it became at once manifest that when lime was used the cream became so viscous that in the case of the "Flash" pasteuriser it was difficult to get the cream to flow into it from the neutralising tank. When the "Batch" pasteuriser was used this difficulty was not, of course, experienced, as the cream is neutralised in the pasteuriser, where the heating is done. But here there arose another difficulty, namely, the increased friction which was brought about in the early stage owing to the viscous condition of the cream when the heating coils were rotating therein, and before the temperature had risen to any extent. Friction of this kind being undesirable, the method required further consideration.

The Goulburn factory is probably the only one in New South Wales that is using lime regularly for the purpose of neutralising cream, and the results obtained have been highly satisfactory as far as quality and London prices are concerned. The manager of this factory adopted lime because he feeds the buttermilk to pigs immediately after churning. He was instructed in the use of lime first by Mr. C. Pedersen, of the staff of the Dairy Branch, and later by one of us (M.A.O'C.). Regarding the quality of the cream received at Goulburn, it might be here stated that it is not of the highest class owing to the fact that frequent delivery is almost impossible, large quantities of the cream coming long distances by rail.

The Ballina Co-operative Butter Factory carried out what also proved to be a very interesting trial with lime and sodium bicarbonate.

Sodium Peroxide Tried.

Owing to these small defects in the use of sodium bicarbonate and of lime, we decided to try sodium peroxide as a neutralising agent.

Mr. Rutter, who has been given a patent in connection with the use of sodium peroxide, made some experimental trials in Victoria, using it as a neutralising agent; but we are not in possession of the details of those trials. One of us (M.A.O'C.) saw a number of butters made at those trials, but whether there was a material defect in the cream used, or defects in the manufacture, we cannot say, but the butter produced was not at all of a good quality, when examined by one of us at Sydney some time after the experiments had been conducted.

The result of the experiments carried out at the Yanco factory are therefore of general interest to factory managers.

Details of Experiments.

The result of neutralising may profitably be considered from three points of view:—

1. The actual neutralisation of, or the combining with, the lactic acid present, forming a neutral salt, lactate of soda or lime, and thereby removing the excessive free acid present.
2. The physical effect on the cream so treated.
3. The effect of aeration as a part of the process of neutralisation.

It was observed many years ago, by one of us (M. A. O'C.), that lime in the form of calcium hydrate or slaked lime, when used as a neutralising agent, produced a peculiar thickening when added to cream, whereas when substances such as sodium carbonate or sodium bicarbonate were used, no such thickening was observed. Since pasteurisation of cream for the manufacture of butter at that time, was rarely, if at all, practised in this State, the facts stated above were simply noted as observations; but now that it is imperative for every factory to produce a high-class butter, pasteurisation has been generally adopted as being absolutely necessary to attain this end. The fact that lime causes cream to become viscid has therefore a particular interest for the factory manager.

Viscosity Tests.

As illustrative of the thickening of cream upon the addition of lime, the results of experiments carried out by us will be of interest. The lime was used both as a very thin lime-cream, and as lime-water. The viscosity was measured in the usual way, by counting the drops passing through an orifice in a unit of time.

Experiment 1.—The sample of cream selected had an acidity of ·33 per cent., and 29 drops passed through the opening of the instrument in 10 seconds. Lime was added in the form of lime-cream (calcium hydrate) to reduce the acidity to ·16 per cent. The number of drops which passed in 10 seconds was then 19½. Or in other words, only 67 drops would pass through the orifice of the pipette in the same time at which 100 drops would have passed prior to the addition of the lime.

Experiment 2.—This sample of cream had an acidity of ·67 per cent. and the drop measurement was 27. A little lime was added, and acidity was reduced to ·58; the drop measurement was then 24½. More lime was added till acidity fell to ·51 per cent. and the drop measurement fell to 24. Further addition of lime reduced acidity to ·23 and the drop measurement fell to 12. More lime was added and the acidity was reduced to ·13; the drop measurement had now fallen to 6½, thereby showing that the viscosity or stickiness of the original cream had increased from first to last about 4·2 times.

Experiment 3.—The cream used was the same as in experiment 2, the acidity being ·67 per cent. and the drops issuing 27. Lime was added to reduce acidity to ·49, when the drops issuing were 22½. Further addition of lime reduced the acidity to ·27 per cent., when the drop measurement fell to 19. More acid was then added in the shape of fresh and untreated cream till the acidity of resultant mixture was increased to ·47 per cent. The drops issuing increased to 21½. A further addition of the untreated cream brought the acidity to ·54 per cent., when the drops issuing were 24½.

Experiment 4.—Fresh cream of ·56 per cent. acidity was used, the drops issuing numbered 29. The acidity was reduced to ·50 per cent. by 1 c.c. of a very thin lime-cream. The drops issuing fell to 28. *The cream was warmed to a temperature of* 94 *degrees Fahrenheit for* 10 *minutes, and then cooled to* 60 The viscosity was then so low that the cream ran in a stream from the orifice and drops were not formed.

Experiment 5—The cream selected had an acidity of ·56 per cent. and 8 drops issued in unit time. Aqueous sodium peroxide was added till the acidity was reduced to ·23 per cent. The addition of small quantities of peroxide solution caused a reduction in the viscosity, which was very noticeable. With the acidity reduced to ·23 per cent. the viscosity was measured by 20½ drops in unit time. Three drops of clear lime-water were then added. The viscosity was affected immediately, and whereas the cream plus sodium peroxide had been smooth and velvety in appearance, on the surface it was then rough and pitted.

The viscosity measurement was then 19½ drops. A further addition of 3 drops lime-water increased viscosity to 18½ drops, but a further addition of 3 drops lime-water showed little increased viscosity. A little stronger lime mixture was then added. The change which occurs when two drops of this are added is at once apparent and is most marked, and a skin forms on top of the cream, which may be pushed about and wrinkled by a stirring rod. Viscosity was then 11 drops in unit time. On adding a further 3 drops of the stronger lime mixture a further increase in viscosity took place, and only 2 drops issued in unit time. The acidity of the mixture at this point was ·112 per cent.

Summarised briefly, experiment 5 shows that in this case the removal or neutralisation of ·33 per cent. acid by using sodium peroxide as the neutralising agent has rendered the cream 2½ times less sticky or viscid than it was originally. The further removal of ·12 per cent of acidity by using lime as a neutralising agent has resulted in a cream which is four times more sticky or viscid than the original cream.

Experiment No. 6.—The effects of neutralisation on a very thin cream was tried. Fresh cream with an acidity of ·30 per cent. was selected. This had a viscosity measurement of 33 drops. Soda was added till acidity was reduced to ·21 per cent. Viscosity was lessened, and was then 35 drops. On adding a little lime the cream at once became more viscid. The addition of lime was continued till the acidity was reduced to ·05 per cent. The viscosity was increased, and was then 15 drops. When lime only is added to the original cream it thickens up at once, and becomes like that portion to which soda was first added, and then lime.

Summarised, experiment 7 shows a corroboration of previous observations, and indicates that lime also produces a thickening effect with fresh thin cream.

Summary of Results of Experiments.

The following points have been brought out by these experiments:—

1. The thickening effect of lime on thick and thin, old and fresh, cream, and this to a considerable extent.
2. The permanency of the thickening while the cream remains cold.
3. The destruction or removal of this thickening effect by heating.
4. The thinning effect in cream when sodium compounds are used as neutralising agents.

Other Experiments.

Following these viscosity tests, experiments, as detailed herein, on neutralisation and pasteurisation of cream were next carried out at a large and up-to-date butter factory. The substances used to neutralise the lactic acid of the cream were (1) calcium hydroxide (quicklime slaked with water) and (2) sodium peroxide, the after-treatment of the cream being the same, or as near thereto as possible, in all experiments. Although the term "neutralisation" is loosely used to indicate the addition of a substance to acid cream with the object of combining with or neutralising the acid present, its use in this connection is just a little vague and indefinite. Partial neutralisation would more correctly indicate what is being aimed at, whereas neutralisation indicates a point where there is no indication either of acidity or alkalinity.

Experiment with Lime as the Neutralising Agent.

The lime used was obtained from the Sydney and North Sydney Lime and Cement Company, Limited, the sample supplied being a very pure one (about 99 to 99½ per cent. CaO).

For use the lime was slaked with water in a bucket, and after the reaction was complete was stirred up into a homogeneous mixture of cream-like consistency. Various proportions of lime and of water were tried, and as a result we found that 1 lb. lime mixed with water, and diluted till the volume of the mixture measured 4·8 pints (or 16 oz. lime mixed with water till the resultant volume measured 96 fluid ounces) was a very satisfactory strength to use. Six fluid ounces of such a lime-cream will therefore contain 1 oz. of quicklime, and this quantity will remove 0·2 per cent. of lactic acid from 10 gallons of cream. In practice it will be found that the majority of creams to be treated will fall within the limits of 0·3 to 0·5 per cent. of acid.

For our experiment a quantity of cream weighing 3,517 lb. was taken. The acidity and weight of the various aliquots making up the 3,517 lb. cream was determined, and from this data the true average acidity of the untreated cream was determined. This was found to be 0·427 per cent.

The mixed cream was valued for flavour at 43 points, although some cream was admitted that was not worth more than 42 points, out of a possible 50. Lime was added in the form of lime-cream as already described (16 oz. lime made up to a volume of 96 fluid oz. with water) and thoroughly mixed with the bulk cream by stirring.

The first portion of partially neutralised cream, showing an acidity of ·35 per cent. in the neutralising tank, was passed through the pasteuriser, and when cooled showed an acidity of ·29 per cent., so that apparently heat is necessary for the complete action of the lime, or that at all events it produces a further action in which acidity disappears, as is shown by the reduction of the figure ·35 to ·29.

To enable the factory to get through the day's work without undue loss of time, it was found necessary to work the neutralising tank continuously, that is to say, fresh cream was tipped into the tank from time to time, and the necessary lime-cream added as required also from time to time with the object of keeping the acidity of the cream in the vat about ·3 per cent. 31 oz. of lime, or 9·3 pints of lime-cream, was used in all for the 3,517 lb. of cream.

When the whole of the cream had been treated, pasteurised, cooled, and run into the receiving tank, the acidity of the mixture was found to be ·25 per cent. To this bulk of cream, 3 gallons of a "starter" showing ·8 per cent. of acidity was added and the whole allowed to ripen. While the ripening action was proceeding, it was observed that the cream was very frothy and that minute particles of butter had formed along the edges of the cooling vat. The mass of this cream appeared to be very different in appearance (being rougher, whereas the other was smooth and appeared thin) when compared with the sodium-peroxide treated cream that was in the adjoining tank.

Ripening was allowed to go on for 16½ hours, when the acidity of the contents of the tank was found to be ·32 per cent. The grading remarks on the lime-treated cream at this stage were to the effect that this cream has a more natural cream-taste than the cream treated with sodium peroxide, and that it would be difficult, if not impossible, to say, without previous knowledge, that anything had been added to the cream by the taste or smell of the resultant product. This cream also appeared to have a more natural ripening than the peroxide treated cream. The cream was churned in two portions; butter made from the first portion was marked "L," and that from the second "L1."

The grading remarks on the manufactured butter were that "L" was unsalted and was "overworked"; it was hardly as good as "L1," was too milky, could have done with more acid, was a little lacking in lactic acid flavour, colour was good, texture just a little greasy, and in flavour was worth about 43½ points, at that time.

The chemical analysis of the butter is given in Table I, attached hereto. From the above data we give the following calculations, which are of interest:—

3,517 lb. untreated cream, of ·427 per cent.
acidity contains ... ... 15·0176 lb. lactic acid.
31 oz. lime = 1·9375 lb. lime is equivalent to 6·2277 ,, ,,
Leaving 3,517 lb. cream, containing ... 8·7899 ,, ,,
The resultant cream should therefore have an acidity of

$$\frac{8{\cdot}7899 \times 100}{3{,}517} = {\cdot}2499 \text{ per cent.}$$

The figure obtained by actual determination was ·25 per cent. It appears therefore from the above, and also from what will be shown when dealing with the sodium peroxide treated cream, that the determination of the acidity of cream by neutralising with deci-normal sodium hydrate, using phenolphthalein as indicator, and expressing the alkali used as its equivalent of lactic acid, is a very close approximation of the amount of lactic acid actually present. This appears to hold good for the 3,517 lb. cream, which represents cream from many individual suppliers, but further investigations on the point are desirable, and will be undertaken as opportunity offers.

Experiment Using Sodium Peroxide.

In the second experiment which was carried out, sodium peroxide was used as the neutralising agent. This substance is closely related to sodium monoxide, which is widely known in the hydrated condition (as when combined with water) as "caustic soda" or sodium hydroxide. The peroxide, however, contains an additional quantity of oxygen, and when combined with water may produce (1) caustic soda and hydrogen peroxide or (2) caustic soda, oxygen, and water, according to the conditions obtaining.

For this experiment 1,100 lb. cream were used; the average acidity was ·45 per cent., and the cream graded 43½ points for flavour.

To this was added 13 oz. sodium peroxide, in small quantities at a time, and which was incorporated with the bulk of cream as well as possible by stirring. It was noted that the peroxide caused the cream to take fire in places, and that it formed small aggregates or nodules that were difficult to break up or to dissolve in the cold. After the whole of the peroxide had been added and thoroughly mixed, two samples were withdrawn for acidity determination, and a mean figure of ·36 per cent. was obtained. The treated cream was run through the pasteuriser, and as the last portions of cream in the neutralising tank were faintly alkaline, the residue was washed out with a very small quantity of untreated cream. As the process of pasteurisation went on successive portions were drawn off for acidity determination, and the following results were obtained:—

A. First portion coming over	...	acidity	·33 per cent.
B. Middle ,, ,, ,,	...	,,	·29 ,,
C. End ,, ,, ,,	...	,,	·23 ,,

When the whole of the pasteurised cream had been run into the receiving tank and mixed, the acidity was found to be ·225 per cent. A little later in the afternoon, upon resuming work, the acidity was determined and found to be ·25 per cent. 1¾ gallons of "starter" having an acidity of ·8 per cent. lactic acid was now added and the cream allowed to ripen.

While ripening was going on it was remarked that the soda-treated cream appeared "thin" compared with the lime-treated cream, and there was an absence of froth on top of the cream. Ripening proceeded for 16½ hours, when the acidity of the mixture was found to be ·27 per cent.

As illustrative of how easily faulty samples may be taken from a tank of cream for acidity determinations and from which erroneous conclusions might be drawn, the following list of samples drawn from the soda-treated cream is given:—

A. Sample obtained by sinking empty dry bottle into tank, opening bottle to receive sample, and closing bottle while removing from tank ...	·268 per cent.
B. Small sample taken with an ordinary "sampler"	·639 ,,
C. Sample taken of the cream running out of large tap discharging into gutter leading into churn...	·536 ,,
D. Sample of cream taken after cream was all run into churn and churn was rotated once ...	·268 ,,

The grading remarks on the sodium peroxide treated cream at this stage was to the effect that peroxide cream was very thin, developed acid, had a slight soda taste, but no ill or objectionable flavour was noticeable. The soda flavour was definite, but was not the same taste as that observed when sodium bicarbonate is used as the neutralising agent. The cream was not quite acid enough.

This treated cream was manufactured into butter and was marked specially. The grading notes on the butter when manufactured were :—" Greasy taste, inclined to be tallowy, with a distinct after-taste of a foreign character; flavour is worth to-day a bare 42 points." The chemical analysis of this butter will be found in Table I.

In the neutralising of this cream the following results which should have been obtained theoretically and those which were actually obtained, will no doubt be of interest :—

1,100 lb. of cream of ·36 per cent. acidity should contain ... ... 3·961 lb. lactic acid.
13 oz. sodium peroxide should neutralise 30 oz. lactic acid ... ... =1·876 ,, ,,
1,100 lb. of neutralised cream should contain 2·085 ,, ,,
The percentage of acidity in resultant should be $\frac{2{\cdot}085 \times 100}{1{,}100}$ ... ... = ·19 per cent.
The observed acidity was ... ... ·225 ,,

A further experiment with sodium peroxide in solution before adding it to the cream was made with the few ounces of sodium peroxide that was available.

For this experiment 183 lb. of cream was taken, and the acidity was determined as ·514 per cent.

In the absence of the Dairy Expert the valuation of the cream was done by the factory manager, Mr. Fackender, a trained cream grader, lately on the staff of the Dairy Branch, to whom we desire to express our thanks for his kind assistance. The notes stated that the creams included varied from 41 to 42 points for flavour.

Sodium peroxide solution was made by dissolving 3 oz. sodium peroxide in 60 oz. ice-cold water, and keeping the dish surrounded with ice till solution was used. It was noted that the sodium peroxide went into solution with very little evolution of gas (oxygen). The aqueous solution of sodium peroxide was added to the cream in successive quantities and mixed thoroughly, and the acidity of the resulting mixtures was determined at successive stages, after the addition of a certain volume of the neutralising agent.

The figures obtained were as follows :—

After addition of 40·8 oz. solution = 2·04 oz. sodium peroxide, acidity derived was ·341 per cent.

After addition of 50·8 oz. solution = 2·54 oz. sodium peroxide, acidity derived was ·328 per cent.

After addition of 54·8 oz. solution = 2·74 oz. sodium peroxide, acidity derived was ·319 per cent.

The balance of the solution, namely, 5·2 oz., was left and kept for observation at a temperature of about 0 degrees Cent. The cream was now pasteurised and run into the equalising tank. Samples taken from this tank showed an average acidity of ·24 per cent. After going over the cooler and run into the receiving tank the acidity was again determined, and found to be ·25 per cent.

It will be noted that the observed acidity of the treated cream before pasteurising was ·32 per cent., and after pasteurisation and cooling this had fallen to ·25 per cent., affording further proof that the pasteurisation results in a further action during which lactic acid disappears. Here we again appear to have further proof that the so-called acidity of the cream as measured by neutralising with deci-normal sodium hydrate, using phenolphthalein as indicator and expressing the amount required in its equivalent of lactic acid, is a very close approximation of the actual amount of lactic acid present.

Note that in neutralising when the stage (1) mentioned above is reached we have 183 lb. (equal to 2,928 oz.) of cream, having an observed acidity of ·514 per cent., and which will therefore contain 15·05 oz. of lactic acid. To this we add 2·04 oz. sodium peroxide, chemically equivalent to 4·71 oz. lactic acid, or which in other words will neutralise 4·71 oz. lactic acid, leaving 2,928 oz. of partly neutralised cream, containing 10·34 oz. of lactic acid. The acidity of this partly neutralised cream should be $\frac{10{\cdot}34 \times 100}{2{,}928} = {\cdot}353$ per cent., while the figure from actual determination is ·341.

Similarly, with stage (2) we would have :—

2,928 oz. cream ... ... containing 15·05 oz. lactic acid.
(add 2·54 oz. sodium peroxide), equal to 5·86 ,, ,,
2,928 oz. partly neutralised cream, containing 9·19 ,, ,,

Acidity of resultant mixture should be $\frac{9{\cdot}19 \times 100}{2{,}928} = {\cdot}314$ per cent.

The figure from actual determination was ... ... ·328 ,,

At stage (3) we have—

2,928 oz. cream ... ... containing 15·05 oz. lactic acid.
(add 2·74 oz. sodium peroxide), equal to 6·32 ,, ,,
2,928 oz. partly neutralised cream, containing 8·73 ,, ,,

Acidity of resultant mixture should be $\frac{8{\cdot}73 \times 100}{2{,}928} = {\cdot}298$ per cent.

The figure obtained by actual determination is ... ·319 ,,
While after pasteurising and cooling the figure was ·25 ,,

The cream was allowed to ripen overnight, and next morning the acidity was found to be ·25.

The opinions expressed by the factory manager at this point are :—Nice clean flavour, slightly watery, with very little, if any, development of acidity from yesterday, slight soda after-taste. This cream was manufactured into butter and duly marked.

The result of the chemical examination is recorded in Table I. This completed our experiments on neutralisation and following up the cream till manufactured into butter.

Note.—On going to examine the 5 oz. of aqueous solution of sodium peroxide left over from above experiment, and which was placed overnight in a division of the brine tank of the ice-making plant for safe storage, it was noticed that in one bottle containing about 2½ oz. the cork had blown out, but the other bottle which had been secured with an india-rubber cork was intact. On opening this bottle secured with the rubber cork, it was observed that an incipient explosion occurred at the moment of abstracting the cork, indicating that a considerable force was locked up. A vapour developed in the bottle, and bubbles of gas came up through the liquid. Apparently, possibly hydrogen peroxide has been formed, and has been resolved into water and oxygen. We had no means at the factory of studying this change in the peroxide solution, but propose to further investigate the matter later.

TABLE I.—Analysis of the Butters made from Cream treated with (1) Lime, (2) Sodium Peroxide, (3) Aqueous solution of Sodium Peroxide, and (4) factory butter produced from cream treated with Sodium Bicarbonate by the factory manager, which is given for comparison.

	(1.) Lime.	(2.) Sodium Peroxide.	(3.) Sodium Peroxide Aqueous Solution at 0°C.	(4.) Sodium Bicarbonate. Treated by Factory Manager.
Moisture	11·89	11·39	12·59	10·47
Fat	86·00	85·33	85·18	86·16
Casein Lactose	1·12	1·22	1·20	1·28
Ash	0·99	2·06	1·03	2·09
	100·00	100·00	100·00	100·00
Containing—				
Lime (CaO)	·024	·023	·019	·021
Boric Acid (H_3BO_3)	·040	·065	·086	·170
Chloride, equal to Sodium Chloride	·930	1·960	·932	1·900

The following analyses of normal unsalted butter by various authorities is given :—

Authority.	Composition per cent.				
	Fat.	Casein.	Lactose.	Ash.	Water.
Koenig (quoted by Lewkowitsch)	87·0	·5	·3	·3	11·7
Richmond	85·81	·74	·37	·09	12·99
Storch (quoted by Richmond), from fresh cream	83·75	·64	·35	·14	13·03
Do from ripened cream	82·97	·84	·39	·16	13·78
Fleischmann (quoted by G. Barthel)	83·75	·53	·60	·12	15·00
Engstrom (quoted by G. Barthel)	83·40	·60	·30	·20	13·50

The average of the above ash determinations gives 0·168 per cent., and taking Fleischmann's analysis of the ash of buttermilk as containing 19·73 per cent. lime (CaO), we arrive at ·033 per cent. of lime (CaO) as the lime-content of normal butter.

Referring to Table I it is to be noted that the percentages of lime in all four samples of butter are all of a similar magnitude, and that the average lime-content of all samples when lime was not added (·021) differs less from the lime-content of the sample where lime *was* added (·024) than does the sample where lime was used (·024) differ from the average lime content of butter as deduced above (·033).

The lime-content, therefore, of butters manufactured from cream in which lime has been used as the neutralising agent may be taken as falling well within the average of analysis of ordinary butters.

Summary and Conclusions.

1. Lime may be used to take the place of sodium bicarbonate for neutralising excessive acidity in cream previous to pasteurising.
2. The thickening effect by lime on thick and thin, old and fresh, cream, and that of a considerable extent.
3. The permanency of the thickening while the cream remains cold.
4. The destruction or removal of this thickening effect by heat.
5. The thinning effect in cream when sodium compounds are used as neutralising agents.
6. The lime-content of butter manufactured from cream in which lime has been used as the neutralising agent falls within the average lime-content of ordinary butters.

Recommendations in the Practice of Neutralisation and Pasteurisation.

From what has been stated above, it will be manifest that in the handling of lime as a neutralising agent the method has to be altered somewhat when compared with those cases wherein sodium bicarbonate is used. Throughout Australia the two well-known methods of pasteurisation, namely, "Flash" and "Batch," are about equally popular.

The "Flash" method is that wherein the cream passes rapidly through the machine until it is brought up to pasteurising temperature, the whole time occupied in passing through the machine being about half a minute. With this system the temperature employed varies from 165 to 185 degrees Fahr., but a temperature of not less than 175 degrees Fahr. is advisable when cream twenty-four hours old, or over, is being pasteurised by this method.

The "Batch" system was so called because the cream is treated as one batch in a vat wherein the cream is held during the process of heating. The heating process may occupy anything from half an hour up to an hour; and, of course, when heat is applied for such a long time, high temperatures need not be used. There should be no necessity to go above 150 degrees Fahr. when this method is employed. In fact, we found some years ago that when utilising this method for the pasteurisation of sweet cream, that 150 degrees Fahr. was the best temperature to work up to. Each of these methods for pasteurising cream has its advocates, but there is not any evidence at present available which would go to show that one system is better than the other. Excellent results have been obtained by those operating either method, and in no case should the manager blame the method as the cause of inferior results.

From what has been shown as the results of experiments referred to, however, it is evident that the technique when lime is used should differ somewhat from that when sodium bicarbonate is used.

Mistakes have been made by operators of the "Batch" system in pasteurising, by over-neutralising the cream. This was due to a method of adding the quantity of alkali required to neutralise a full vat of cream, though at the time the vat may have been only half full, and filled later. This was done for the purpose of expediting operations ; but factory managers have been warned from the very beginning on no account to go so far as to neutralise all the acid present in cream prior to heating.

Let it be clearly stated here that the addition of soda or lime to cream to to an extent which renders it alkaline, is disastrous from at least two viewpoints. Firstly, the cream when introduced to the pasteuriser from the neutralising tank, in the case of the "Flash" method, may be partly churned on the heat being applied, and secondly, the action, even for a short time, of heat when an excessive quantity of soda or lime is used will be extremely injurious from a quality point of view.

If the "Batch" system of pasteurisation is adopted, and the cream added in sections, whereas the whole of the alkali is added at one time, the result in the case of soda would be as already indicated ; and the result in the case of lime being used as a neutralising agent would be, in addition, that the cream would become so thick and viscid, that the friction brought about by the turning of the coils would be sure to affect the butter-fat very injuriously. In fact, the greatest care has to be taken with the "Batch" or "Holder" process, when lime is used as a neutralising agent, for long before all the acid is neutralised the cream becomes very thick and gluey or viscid ; and consequently it is recommended that only about half the *necessary quantity of lime* be added at first, and that heat be then applied, and when the temperature has reached 100 degrees Fahrenheit, the additional quantity of lime necessary to neutralise the excess acid should be added. The manager of the Goulburn factory (Mr. East) adopted this method on our recommendation about a year ago, and has experienced no trouble since.

In pasteurising cream in which a good deal of acidity has been developed prior to neutralisation, it must be borne in mind that the fat globules are not so well protected (even though neutralisation has been done in the best manner) as in the case of sweet cream. This is owing to the action of lactic acid on the proteid matter. It will be necessary, as a consequence, that care be taken to prevent the friction and heat of pasteurisation (more especially by the "Batch" method) *from causing a greasy butter to be manufactured.*

Those factories that have suitable accommodation for the storage of cream in proper tanks at the present time, will find it more economical to adopt the "Flash" system of pasteurisation ; whereas those factories whose arrangements for the holding and cooling of cream are not up to date, may find the "Batch" system more suitable to their requirements, for they can thus combine both vat and pasteuriser in one.

An Improvised Pasteurising Plant.

O. C. BALLHAUSEN, Dairy Instructor.

Mr. J. McDermott, the Manager of the Bonalbo Dairy Company, has made use of an ingenious method of pasteurising cream.

Adopting the same principles and implements that have for years been used for the rapid cooling of cream, and substituting hot water and steam for cold brine, and with a few additions to the cooler (or heater), a most satisfactory pasteurising plant for small factories has resulted.

Pasteurisation of cream, together with neutralisation, has been generally adopted during the past two years, and practically all the larger factories in the State have adopted one make or another. The cost of a pasteurising plant is almost prohibitive in the case of the smaller factories, and it is generally these smaller factories, situated often many miles from rail or seaport, that have the greatest difficulty in marketing their butters in good order.

Bonalbo factory is in this position, being 43 miles from the nearest railway, over very heavy roads part of the way. Prior to the practice of pasteurising described later, Bonalbo factory could not market butter better than first quality in Sydney. During the past season, and since using this improvised pasteuriser, only three consignments had to be re-marked from choicest to first quality in Sydney. The cost of the additions, alterations, labour, &c., amounted to only about £5.

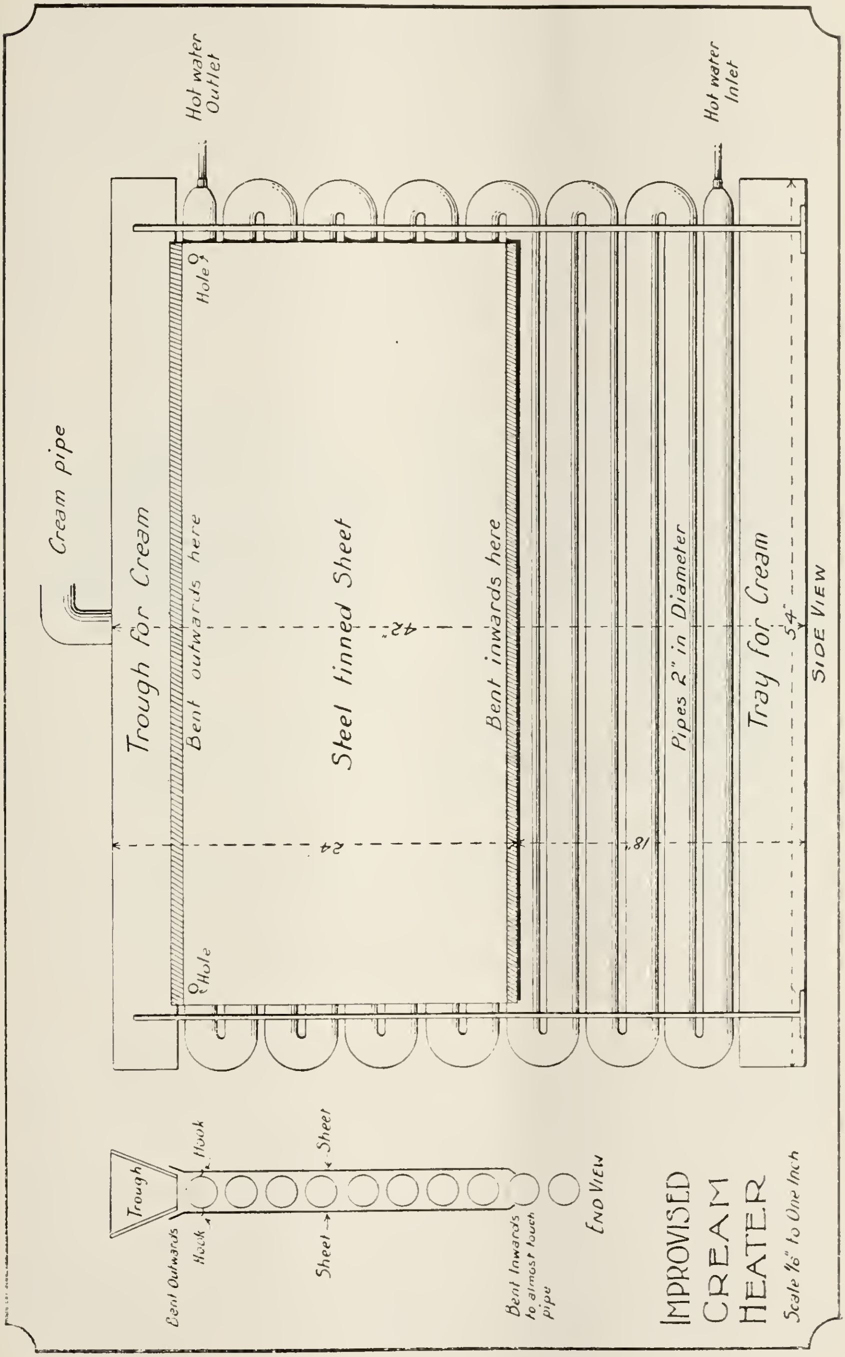
Description of Apparatus.

An ordinary rapid pipe-cooler of sixteen pipes is used for heating purposes, the height being 42 inches and the length 54 inches. The pipes are 2 inches in diameter, with a flange under each one. The usual trough is fitted to the top of the heater to distribute the cream evenly, a tray at the bottom to catch the heated cream, and fluming to convey it to the tanks.

Owing to the tendency of the fresh cream to splash off as soon as it fell on the heated pipes, it was found necessary to provide two tinned steel sheets, 24 inches high and 54 inches long. These are fitted close against the bottom of the sides of the trough, about half-inch from the pipes on opposite sides. The bottom edge of each is bent in slightly so as almost to touch the pipes, in order to convey any cream that may have splashed on the sheets back again to the pipes of the heater.

It will be noted that a depth of 18 inches at the bottom of the heater is not covered by the sheets. The object of this is to give the gases and steam from the heated cream a better opportunity of escaping and to some extent aerate it. These sheets are hung by small holes near both top corners on hooks attached to the top pipe, and are easily detachable for cleaning the heater. This is all the heater consists of.

A steam-driven pump forces boiling water from a vat, kept constantly boiling by an injection of steam, to enter the bottom pipe of the heater, and is conveyed by piping, after going upwards right through the series of pipes, back again to the vat, to be used over and over again. Mr. McDermott found it



IMPROVISED CREAM HEATER
Scale ⅛" to One Inch

necessary from experience, for the more effective heating of this water, to inject live steam direct into the piping, between the pump and the heater. It is not advisable to inject this steam on the suction side of the pump, as it causes erratic working of the pump.

Live steam alone was tried for heating, but it caused the cream to rapidly cake or burn on the pipes, and the most satisfaction has been obtained from the boiled water and steam injection on the delivery side of the pump. This gives a high moist heat.

The cream is collected in a large vat, and is pumped steadily by a cream pump over the heater, a short length of fluming carrying it to the attemperating tanks.

The pipes of the attemperators, which have the up-and-down motion, may also have hot water pumped through them by the same steam pump and necessary pipe connections. This is rarely found necessary, except occasionally during the coldest days in the winter.

The cream passes off the heater into the tanks at from 160 to 170 degrees Fah., and is left in the tanks for about half an hour; 450 gallons an hour can be heated to a temperature of 160 degrees.

Cooling is then commenced by pumping ordinary cold water through the attemperator pipes, the same pump being used for this purpose. In fact, by a series of pipes and taps, the one pump is used for all the operations necessary, viz., pumping in turn boiling water, cold water, and finally cold brine. Cooling is continued until the cream is reduced to a temperature of 48 degrees, and is churned next day at that temperature.

Points to be Observed.

The whole operation is very simple. The point requiring most attention is to drive the cream pump to deliver the cream over the pipes at a speed for the most effective heating, but this applies to practically all pasteurisers of the Flash type.

Other points necessary to observe are as follows :—

- It is advisable, after heating has been finished, to rinse the remaining adhering cream off the heater by pumping hot clean water over the pipes immediately. After doing this, and to make the pipes easier to clean, cold water should be pumped through the heater.
- Hose connections for the attemperator coils should consist of the best steam hose.

Mr. McDermott is of the opinion that a heater of a greater height than the one he is using, which is the one originally installed at the factory for cooling, would give still more satisfaction.

Comment by Acting Dairy Expert.

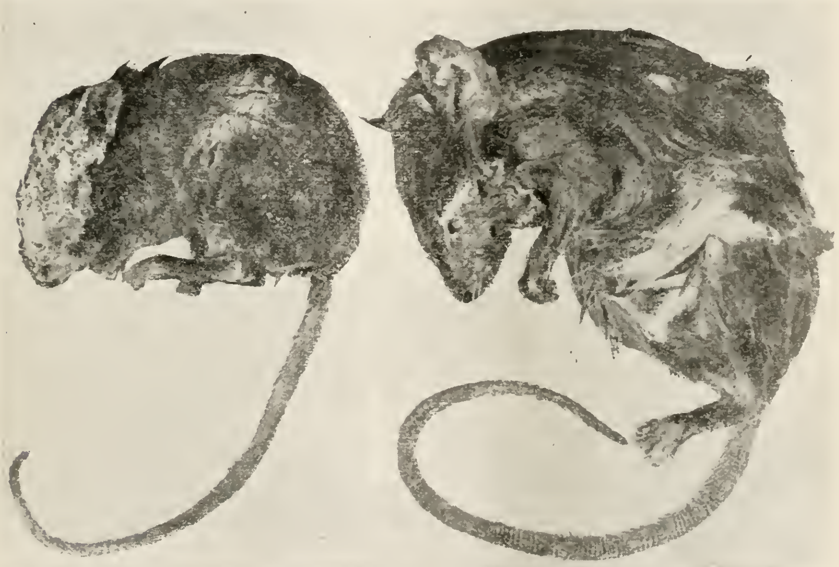
Mr. L. T. MacInnes adds :—This system is practically a combination of the two chief methods of pasteurisation, and a similar arrangement would meet the requirements of a factory manufacturing from 2 to 3 tons of butter per week.

It is of interest to note that on examination of butter manufactured from cream pasteurised under the system described, it was found to be of choicest grade, and showed no signs of a cooked flavour.

A Fungus Disease of Mice.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

The mice plague has diminished, if it has not entirely disappeared. Fortunately, whenever animals congregate together and breed in vast numbers in a limited area, sooner or later an epidemic disease generally breaks out and kills off a large number of them. Seldom, if ever, are all of them killed off; a few survive to carry on the race and transmit their immunity. If the disease persists, their immunity is likely to increase as they breed, and the most susceptible die; if the disease disappears from the locality, their immunity is likely to disappear also in course of time, no selective action taking place. A number of mice appear to have died of disease. One disease that killed some of them, it is difficult to estimate how many, was a fungus disease known as Favus. This made its appearance in several districts. The illustration shows two mice attacked by it. These mice were preserved in formalin solution, hence the details of their fur and of the fungus, which were wet, do not stand out particularly well in the photograph, but on the head of each mouse near the ears there is visible a white growth. This is due to the Favus fungus, and under the microscope fungus threads and spores are to be found in it. The mouse on the left-hand side is very badly attacked; the white patch on the side of the mouse on the right-hand side is not due to the fungus.



Two mice attacked by the fungus disease known as "Favus." The fungus is seen as white patches in the neighbourhood of the ears. (Natural size.)

There is some little doubt as to the actual species of fungus causing the Favus disease, but this much is certain: it infects mice and kills them; it also infects other animals. It infects man and sets up a species of "ringworm" disease that is even more serious than the ordinary form of ringworm. It would be well, therefore, if any diseased mice have been handled, or if material in which a large number have been present has been dealt with, to subsequently disinfect the hands and arms by swabbing them over with a weak solution of formalin (1 part of commercial formalin in 500 parts of water) and the head and neck with a weaker solution.

Marshall* thus refers to the Favus disease: "Favus is caused by *Achorion schönleinii* (Remak), and affects man, cats, dogs, mice, rabbits, and fowls, and many wild animals. This is characterised by crusts, thickened at the edges and somewhat cup-shaped in the centre, composed of the mycelium of the mould cemented together into masses of glairy substance. Below, these crusts are in contact with the true skin. The fungus penetrates especially into the hair follicles and hairs themselves, which later are shed. It attacks different species of animals with varying symptoms, but produces more serious lesions than those of *Trichophyton.*† Favus is especially serious, as it attacks man. Efforts to show that this fungus is merely a parasitic form of some species of higher fungi have failed. The diseased conditions have become so well defined and are reproduced so uniformly as to indicate a fixed habit in the organism, whatever its source or relationship."

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* Marshall, Charles E. Microbiology, 2nd Edition, p. 727.

† Barber's Itch or Ringworm is due to the fungus *Trichophyton tonsurans*.

THE PEACH TIP MOTH.

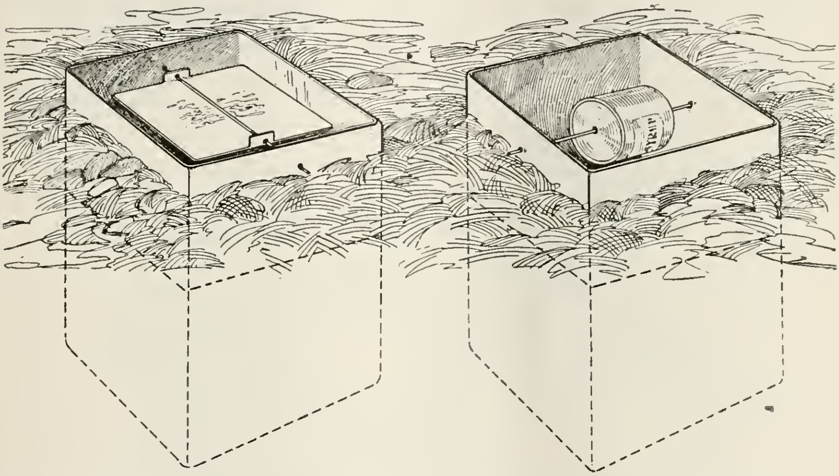
A CORRESPONDENT recently forwarded specimens of tips of the young shoots of peach trees which had died from some cause unknown to him. In reply, the Fruit Expert (Mr. W. J. Allen) stated that the dying of the tips of shoots was caused by the larvæ of the peach tip moth. The grubs, when they hatch out from the eggs laid by the moth, attack the very tip of a tender shoot, and eat their way down through the centre, causing the tips to wither and die. The Department has carried out experiments with poison sprays, such as arsenate of lead, but so far they have not given satisfactory protection, probably because the tip grows very fast and is only protected by the poison for a very short time after spraying. Attempts at control are therefore at present confined to reducing the number of the insects. If the tips can be taken from the tree before the grub has left them to find a suitable hiding place to pupate, they can be destroyed by burning. A bandage of some thick material such as old dark cloth or bagging could be tied around the stem or main limbs of the tree and examined regularly twice a week, and any tip moth larvæ or pupæ hiding in them killed. The later broods of this moth will also attack the fruit in similar manner as the codlin moth attacks pome fruits. Any infested fruit should be destroyed by burning or boiling. The effect of such methods as those indicated is often partially nullified by other trees in the neighbourhood being neglected.

A Simple Form of Mouse-trap for Use on Farms.

Particulars of a successful form of mouse-trap have been supplied by Mr. W. F. Seiler, of Pleasant Hills, through the courtesy of Mr. James Pemell. Mr. Seiler has caught 195 mice in one trap in one night at the side of a haystack.

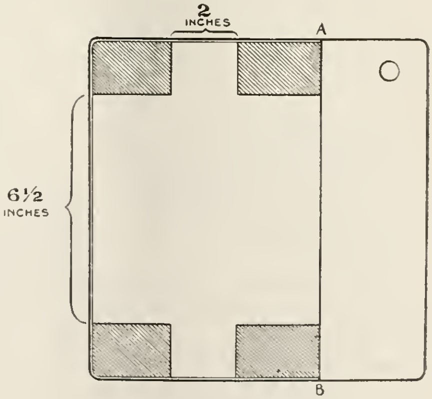
While various forms of mouse-traps have been used during the recent infestation, and possibly many farmers are familiar with this particular type, it may be found new to others, and a description is therefore appended.

The top of a kerosene or petrol tin is removed, and holes bored about 2 inches from the top. No. 8 or 10 fencing wire is inserted through one hole, then through a round tin (with a lid, such as a 2 lb. treacle container) 4 to 6 inches long and 3 or 4 inches in diameter, and finally through the other hole in the kerosene tin, so that the round tin will revolve easily. Then sink the tin half way, or more, in the ground, fill the tin half full of water, and rub a little fat on the roller. Place a few stones or boards round the tin for the mice to run up on, and as soon as they jump on the roller their weight will cause it to revolve and they are dropped into the water.



The traps should be cleared every morning, and fresh water added twice a week.

Mr. Pemell suggests a modification, and uses the top of the kerosene tin, cut and bent as marked. The tray thus made should hang very freely, and should be well greased. He states that when the rats were prevalent in Sydney some years ago the ratcatchers used as a bait a paste made of condensed milk and cheese, which was found very effective. This might be used to rub on the roller or tray.



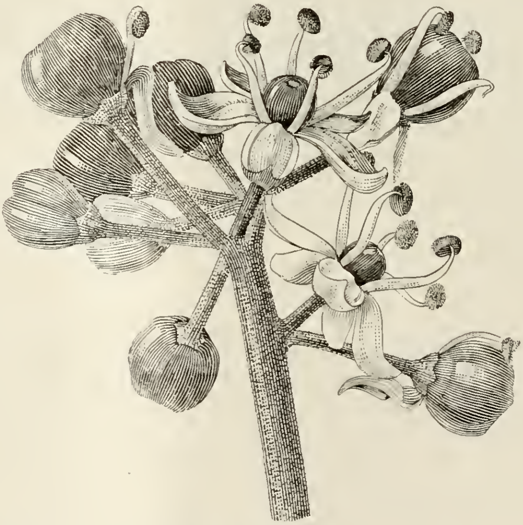
The illustrations show the way in which both forms may be used.

The Mexican Apple (*Casimiroa edulis*) in the Botanic Gardens.

E. N. WARD, Superintendent, Botanic Gardens, Sydney.

THREE years ago I prepared the following note for the Annual Report:—

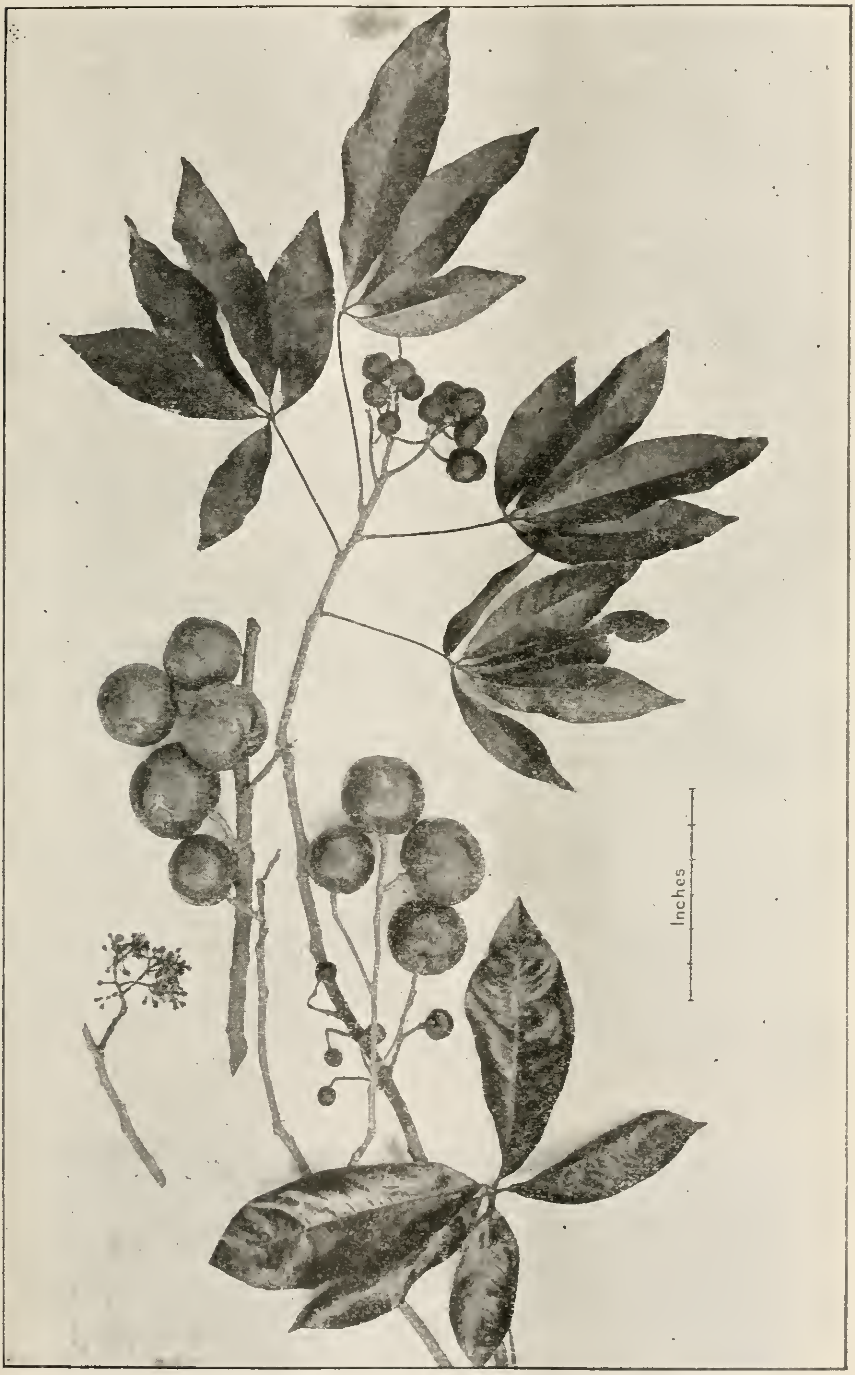
" *Casimiroa edulis* La Llave (*Rutaceæ*), fruited for the first time. It is a medium-sized tree, of free growth, with pale green leaves and green flowers borne in racemes. The fruit is as large as a medium-sized apple, delicious in flavour, flesh white and melting, similar to a Williams Bon Chrétien pear; skin yellow, like the Cleopatra apple when ripe, with a stone nearly as large as an almond. After eating the fruit none of the sleepy after-effects which it is supposed to produce were noticed. The crop was not free enough as yet to recommend growing commercially, but I believe that in the hands of a fruit expert it could be made to bear freely like some of the persistent varieties of pears "



Mexican Apple

Inflorescence showing stamens, petals, and fruit in earliest stage.

Since the above was written, careful note has been taken of its habits of growth, flowering and fruiting. It was planted about ten years ago, when it grew quickly into a tall slender plant, something after the style of an unpruned maiden prune. It was cut back to 4 feet, and for six years its growth was very much restricted in order to give surrounding plants room



The Mexican Apple (*Casimiroa edulis*).
Showing type of foliage and flowers, immature fruit, and almost ripe fruit on the one branch.

to grow also. During the year previous to the arrival of members of the British Association for the Advancement of Science (1914), it was decided to leave certain trees unpruned to show as much as possible their natural characters, and this *Casimiroa* was one of them. The effects of this was that the long shoots of the previous season began to flower and eventually set some fruit. Since then the tree has only been thinned out just sufficient to let air and light in, and has now grown to the height of 15 feet. During 1915 it flowered profusely but set no fruit. Last year it flowered both in spring and autumn, and both crops of flower set fruit, which ripened, and was eaten with again no ill effects. The seeds were sown and germinated, and these plants in due course were planted in the Botanic Gardens for a further test to ascertain how soon it could be made to reach its fruiting stage.

At the present time this plant can be termed a typical rutaceous fruit tree, if the Citrus be taken as the type, for it is in full growth, is in flower, is carrying a second crop of fruit as large as marbles and has also a payable crop of fruit that will soon be ripe, as big as apples, and in places hanging in bunches of from four to seven.

Unfortunately, this Mexican apple as an edible fruit has a big handicap against its becoming popular, for as far back as 1876, in a standard work "The Treasury of Botany," the following passage occurs: "*Casimiroa edulis* is a tree, native of, and cultivated in, Mexico. Its fruit, when eaten, has an agreeable taste, but induces sleep, and is unwholesome. The seeds are poisonous. The bark of the tree is bitter, and it, as well as the leaves, and also the seeds, when burnt and reduced to powder, are used medicinally in Mexico."

If having a good "feed" of this fruit is any test, the writer can vouch for its being harmless, also for its being very luscious and enjoyable. It is a pity that such a fruit should have this slur on its character unless there is good cause for it.

Some of the present crop will be used in an endeavour to obtain a reliable medical and chemical opinion on the question of its being wholesome or otherwise, whilst the rest will be propagated with a view to obtaining a cultural test on practical orchard lines.

The Peanut.

W. D. KERLE, Assistant Inspector of Agriculture, and Experimentalist,
Hawkesbury Agricultural College.

Introduction.

An investigation of the possibilities of peanut cultivation, both as to production and market, together with numerous inquiries by farming interests, has led to this summary of the available information from departmental and other sources. It is only too apparent that our own information must be very largely supplemented by the accumulated knowledge of countries with an extensive peanut experience.

Free use has also been made of reports of field trials made by the Experimentalists at Grafton Experiment Farm (Mr. K. B. MacPherson) and at Yanco Experiment Farm (Messrs. A. N. Shepherd and J. M. Pitt).

The peanut (*Arachis hypogæa* Linn.) is known in different localities as the groundnut, earthnut, goober, ground pea, pindar, and mandubi.

Its native habitat has been for a long period a matter for dispute among botanists, and has never been definitely settled. Some favour an African origin, but the weight of evidence brought by De Candolle* seems to indicate beyond doubt a Brazilian origin. It has never been found in a wild state, but the fact that six other species of the genus have been found wild in Brazil is significant. It became an extensively cultivated plant between the tropics of the eastern continents many years before its merits were recognised in the supposed land of its origin. Authentic records show it to have been an important article of food of the African natives in the seventeenth century, for it to have been included in the cargoes of slave ships as part of the provisions for the captive negroes. This has led many botanists to believe it is of Eastern origin, and to endeavour to trace its spread from Japan or China through India to Africa. If it is of Brazilian origin, then we might well ask how the species came to be distributed in the old world. De Candolle, than whom we have no more reliable authority, is inclined to believe "that the first slave ships carried it from Brazil to Guinea, and the Portuguese from Brazil into the Islands to the south of Asia in the end of the fifteenth century."*

One of the greatest peanut-producing countries of the present day is the United States of America. The commercial importance of the peanut there dates from between 1865 and 1875, although it was introduced in the early days of settlement. The development of the industry in the last forty years has been phenomenal, owing to the soil and climate, particularly of the eastern states, being admirably suited to its growth, and to the increasing demand for home consumption in the wide range of purposes for which it is adapted.

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* L'origine des Plantes cultivées.

In the last ten years the increase in production has been very rapid, and the most recent valuation in the peanut belt gave the holdings as worth £4,000,000. No less than 220,000 farms, aggregating 885,000 acres, are engaged in peanut production.

In 1908 the estimated value of the commercial crop was £2,400,000, and since then there has been an increase of 25 per cent.

With regard to the cultivation of the crop in Australia, practically nothing has been done on a commercial scale. In New South Wales the first introduction of American varieties by the Department of Agriculture was made in 1912, since which year they have been given a thorough trial and have proved beyond doubt that they are eminently suitable for our climate and soils. Excellent yields have been obtained, and when their commercial value is thoroughly realised and the proper labour-saving implements have been obtained, &c., there should be a big future for the crop in New South Wales, Queensland, and Victoria. We should at least endeavour to produce the £30,000 worth of nuts annually imported from China and Japan to supply the local domestic demand.

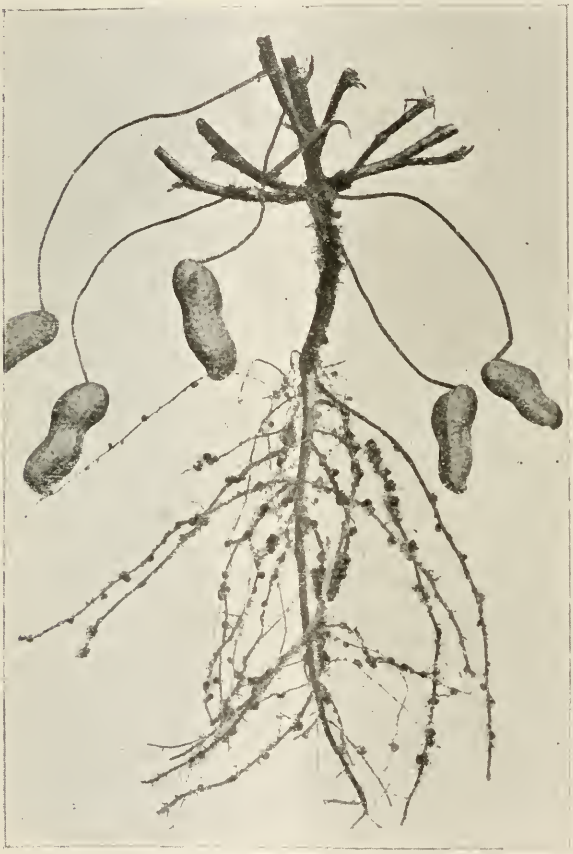

Fig. 1.—The Peanut Plant showing bacteria nodules.

Although peanuts are usually regarded only as the roasted article, this is only one form in which they are used. They are used very extensively in the manufacture of confections and food products. It is, for example, one of the most important of the world's oil products, the United States alone utilizing nearly 1,000,000 gallons annually in the manufacture of oleomargarine.

As a farm product it is of considerable importance, for the entire plant is almost a balanced ration, being rich in protein, carbohydrates, and fat.

Botany.

The peanut belongs to the order *Leguminosæ*, and is botanically named *Arachis hypogœa* Linn., in reference to the characteristic manner in which the fruit is matured underground. Among the members of the order it is unique, for no other plant possesses this peculiar habit.

It is an annual; and strictly speaking, its fruit is not a nut but a true pea. Its stems are procumbent, spreading or erect, angular, thick, pale-green and hairy, especially towards the extremities. The leaves are compound, leaflets obovate, micronate, margin entire, ciliate when young, smooth and almost leathery with age, leaves closing slightly at night and in rainy weather. The flowers are small and yellow in colour, and carried at the end of a calyx tube with the ovary at the base. As soon as fertilisation takes place the petals fall, the peduncle, or short thick stem that carries the lower portion of the flower, elongates and penetrates the soil, where the ovary at its extremity begins to enlarge and develop into a pale, wrinkled, slightly curved pod containing edible seeds. If after the fall of the flower the peduncle does not, through accident, penetrate the soil it withers off and dies. The pod is woody and veined, the testa red or brown, and the embryo possesses two large fleshy cotyledons and a very short radicle. The roots of the plant are branched, but not fibrous. Characteristic of the *Leguminosæ*, it contains on its rootlets tubercles of various sizes. These tubercles or nodules contain myriads of microscopic organisms (rhizobia), which have the power of collecting the free nitrogen of the atmosphere and storing it within the tubercle, where it can be utilised by the plant or may supplement the nitrogen content of the soil. For this reason the peanut is a most desirable crop for soil renovating or improvement. (Fig. 1.)

Climate.

The peanut will thrive under a wide range of climatic conditions, but that best suited to the production of profitable crops is one in which maize will grow luxuriantly. Ideal climatic conditions are an early spring, a moderately hot summer of even temperatures with light rainfall, and a comparatively dry autumn, so that harvesting may take place with the minimum of injury to the nuts and vines. The crop is very susceptible to frost; a climate in which there is a season of five months free from frost is necessary.

Being such a largely cultivated plant and a native of intertropical countries, it might be regarded as only suitable for warm, moist climates, but it has been very successfully cultivated in the United States as far north as the southern portion of the States of Illinois and New Jersey. It has been noticed, however, that the climate affects the quality of the nuts, those grown in tropical countries having a considerably higher oil content than the same varieties grown in the temperate zones, and consequently are the more valuable for human food. Analysis of the same varieties grown in different latitudes would seem to indicate that "the content of oil is in inverse proportion to the distance from the Equator."*

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* Farmers' Bulletin, No. 25. U.S. Dept. of Agric.

That portion of our own State which most nearly approximates the ideal climatic conditions for the peanut is the North Coast. There are, however, other districts where it could be grown with a similar measure of success, particularly for oil production and for feeding to stock. In the United States the limits of profitable production are between the parallels of 26 degrees and 40 degrees north latitude, the nuts most in demand for human food being those raised between 36 degrees and 37 degrees. The whole of New South Wales lies within the corresponding parallels of south latitude. While taking cognisance of this similarity of latitudes, we must not lose sight of the modifications in climate due to the very different distribution of land masses and ocean currents in the two hemispheres. The Department's experience indicates the Murrumbidgee Irrigation Area and the North and Central Coast as climatically suitable districts, but it is exceedingly likely that the establishment of the peanut in those localities will lead to its profitable production in most parts of the State, with the exception of the highlands and southern slopes.

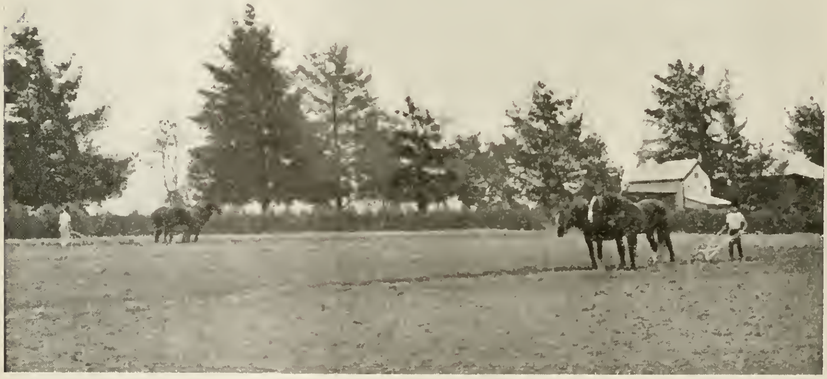

Fig. 2.—Preparing Land for Peanuts

Soil.

The class of soil that will produce the most marketable nut for roasting is a light, sandy, calcareous loam, greyish in colour, and with a well-drained clay subsoil. Darker soils contain a high percentage of iron or other mineral or organic matter, which may impart to the pods a dark stain and depreciate their market value. It is important to realise that this staining of the shell has no detrimental influence on the quality of the kernels. However, as is the case with all other crops, cognisance must be taken by the producer of market prejudices, and he can only hope that the future will see a more rational and scientific basis for market standards.

Although a sandy soil with a moderate amount of humus and rich in lime is regarded as ideal, the largest nuts and often the heaviest yields are obtained on clay soils containing a high lime content. Practically any soil that can be reduced to, and kept in, a friable condition will grow peanuts. It is essential for the soil to contain a fair percentage of lime in an available form, or unfilled pods will result. Stiff tenacious clays (which are invariably cold and inert), sour, badly-drained soils, and those which become so set and firm on the surface as to prevent penetration of the peduncle and consequent failure to pod, are quite unsuitable for peanut growing.

In this State there is an abundance of soils that will produce to perfection the bright, clean pod required for roasting, and an even larger area is available for the production of the less attractive, though often larger, nut, for use in the manufacture of confections, peanut oil, &c., or for use on the farm as food for live stock.

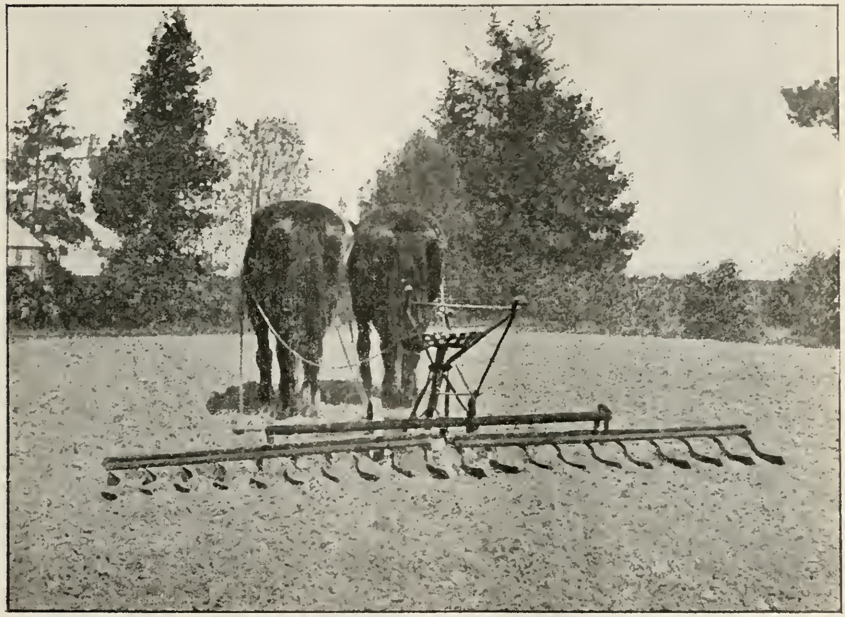

Fig. 3.—The Pulverising Harrow

Preparation of the Soil.

The factors chiefly influencing the preparation of the soil are its physical nature, the climate, and the time of sowing. The object is to have available at sowing time a deep, friable seed-bed, with 5 or 6 inches of well-worked soil. The cultural methods adopted to obtain these conditions will depend on the district. In the coastal districts, where the cropping is usually intense, only short periods are available for preparation. As soon as the preceding crop has been harvested, the land should be ploughed, care being taken to completely cover any stubble or organic matter, which must be well decayed before sowing is attempted.

The ploughing should be deep (6 or 7 inches), but the subsoil must not be brought to the surface. After ploughing, harrows and cultivators should be employed to work the soil, which can be allowed to lie idle until sowing time, when, if it has been set by rain, it should be cross-ploughed to a depth of 4 or 5 inches, harrowed and sown. If it is still in a fairly loose condition, it will only be necessary to cultivate to prepare for sowing, using the spring-tooth or disc cultivator. A handy implement which, following the plough, turns, pulverises and levels the soil in one operation, leaving it in a good condition for sowing, is the pulverising harrow (Fig. 3). When the surface is cloddy or, in the case of sandy soils, rather too loose, a very effective implement that will leave the soil in a compact, fine, but not smooth condition is the packer (Fig. 4).

It is essential that all possible means should be adopted to destroy weed growth, so that a clean fallow is presented when the seed is sown, otherwise the young peanut plant will be suffocated. In general it might be said, for the coastal districts, that the preparation necessary for maize is equally as efficacious for peanuts. In less favoured districts where the rainfall is normally meagre, more thorough cultivation is necessary to conserve the moisture that falls before sowing, and thus to augment the rainfall of the growing period.

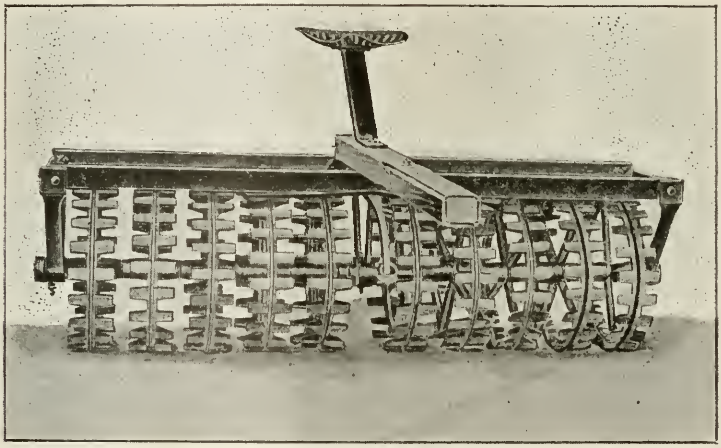

Fig. 4.—The Pulveriser and Packer.

In these districts early autumn ploughing is necessary, as is harrowing or cultivating after every rain of any magnitude in order to conserve all the moisture possible. At seeding time it is only necessary to cultivate and harrow to prepare the soil for sowing; in fact, ploughing at that time may result in serious loss of moisture by evaporation.

In districts where the rainfall is excessive for several months of the year, or where the drainage is poor, slight sowing ridges should be constructed in preference to drilling.

The peanut responds to thorough cultivation more quickly than most crops, and every effort should be made to produce a seed-bed characteristically fine, mellow, and clean.

(*To be continued.*)

Poultry Notes.

February.

JAMES HADLINGTON, Poultry Expert.

A FEATURE of the past month which indicated the progress that is being made in the poultry industry was the meeting in Sydney of an Inter-State Conference of the National Utility Poultry-Breeders' Association. The decisions there arrived at, and the discussions that took place, will have an important influence in moulding the course of the poultry industry. Among the many matters of vital importance that came under discussion was the adoption of standards for the guidance of utility poultry breeders, and the judging of their birds.

Hitherto a good deal of misunderstanding has existed among utility men on the subject of standards. One had only to mention the points of a breed to be deemed to be talking about show birds. It is to be hoped that the discussion that took place at the Conference, together with a lecture given by the writer on one of the evenings, will help to clear away some of this misconception, and inculcate the necessity that exists for the better understanding of points of the breeds, both from a standard and utility point of view.

As an instance of the awakening in regard to the necessity for standards, it may be mentioned that less than four years ago, when the Department sought to introduce the minimum weight standards into the Hawkesbury Agricultural College egg-laying competition, considerable opposition was shown to the innovation. To-day, the necessity for such a standard has been almost universally recognised by poultry breeders throughout Australia, and the principle has been adopted in the laying competitions in other States.

Unfortunately, the novice poultry-farmer has been led to believe that by procuring certain lines of blood, deemed to be of high productive strain, and by selecting his breeders on some systems of measuring the pelvic bone, abdomen, &c., a knowledge of breed characteristics is unnecessary; at any rate, only too many have acted on these principles. As has previously been pointed out, in so far as the preservation of breeds is concerned, this practice has been a fatal mistake, with the result that many flocks of what should be pure breeds showing distinctive character have degenerated into nondescripts; yet their owners would in many cases consider, from the fact of their selecting on the systems referred to above, and working on certain lines of blood, that they were breeding on scientific lines.

It was pointed out in the lecture referred to that there could be no scientific breeding of poultry without a breed standard as the groundwork, and a working knowledge of that standard on the part of the breeder which will enable him to select in accordance with the standard of the breed, and it is folly to attempt to "line-breed," which many do, without such knowledge.

Anyone aspiring to become a recognised breeder of stud poultry should certainly acquire this knowledge. Not only so, but the contemplated action of the National Utility Poultry Association to establish a breeders' register will eventually compel attention to this fundamental requirement on the part of those wishing to register as suppliers of pure-bred stock.

It might be mentioned that it is only this knowledge that will help the poultry keeper to detect impurity of breed. One sees simple white fowls, for instance, being bred from as White Leghorns, and black fowls as Black Orpingtons, but the mere fact of colour or size does not constitute them to be such. Signs of impurity in White Leghorns might be detected in glaring instances by black or brown feathers; but perhaps there might be other signs—legs other than yellow (they might be only pale or bleached), extreme broodiness and tinted eggs. There might, however, be more subtle indications that can only be detected by a knowledge of the breed character. The great danger is that birds may be used for breeding where a taint has crept in, but in which the indications of impurity are not visible although carried recessive in the blood. Such may only be detected through individuals in a flock. The same applies to Black Orpingtons and, of course, other breeds. The more visible signs of impurity of breed may be departure from type; for instance, a black bird may be of Langshan or Plymouth Rock type, or perhaps something between the two, the result of the introduction of, say, a clean-legged Langshan or a black sport from Plymouth Rocks. In addition to lack of type in such cases, other indications would be expected to show themselves in the flock, such as yellow or willow legs, or the laying of pure white eggs; and it should be understood that the eradication of these faults, once introduced, becomes extremely difficult by ordinary methods. The above are given as instances of the mistakes made by poultry keepers when not equipped with a knowledge of the standards.

There are, perhaps, more culls and throw-backs and a greater tendency to nondescript specimens among poultry than, perhaps, any other animals, principally because most of our modern breeds are of comparatively recent make-up. The result of this is that less reliance can be placed upon lines of blood. Selection in the light of standard requirements becomes, therefore, of the utmost importance, and it is satisfactory to note that this question is being taken up seriously by utility poultry-farmers themselves.

Standards for the three principal breeds—White Leghorn, Black Orpington, and Rhode Island Red—with illustrations of the breeds, were published in the March issue of the *Agricultural Gazette*, and have been included in "Poultry Farming in New South Wales."

The following is the standard of utility poultry of all breeds adopted by the Conference:—

UTILITY POULTRY STANDARD.

Type—	In accordance with the accepted standard of the breed.
Colour (Plumage and lobes)	
Legs and Feet (Colour)	
Condition—Health, furnishing, brightness and cleanliness of feather and legs.	

Conformation—
- (*a*) Length, depth, and width, proportionate to the type of the breed.
- (*b*) Length as taken from the base of the neck to the base of the tail.
- (*c*) Depth to be determined by the vertical space between the back and the breast-bone and between the end of the breast-bone and the pelvic bones.
- (*d*) Width as measured across the saddle and immediately behind the wings, and as indicated by the distance apart of the legs.

Freedom from Coarseness—
- (*a*) Shanks strong, as differentiated from either extreme coarseness or fineness of bone.
- (*b*) Pelvic bones strong at the base—long, fine, and straight.
- (*c*) Tissue—Pelvic bones to be as free as possible from gristly covering.

Head—Finely modelled ; skull deep over the eyes, full and rounded at back.

Eyes—Full, bright, and expressive.

Face—Bright, lean, free from feathering, and not sunken.

Comb and Wattles—Neat, fine in texture and medium in size, avoiding "beefiness."

Neck—Fine and fairly long.

Skin and Abdomen—Texture of skin to be of the thinnest and finest quality, and pliable; abdomen to be elastic, avoiding sagging in, or fulness indicating excess of fat.

Plumage—Feathers soft and silky, close, but not hard as in Game ; fluff moderate.

Weights—Light breeds ½ lb. to 1 lb. above minimum, and heavy breeds 1 lb. to 1½ lb. above, to score maximum points ; if in excess, to be cut correspondingly.

MINIMUM WEIGHTS.

Light Breeds.

		lb.		lb.
Leghorns	Cockerel,	5	Pullet (at 6 months old)	3½
Minorca	,,	5	Any Pullet	4
Andalusians	,,	5	,,	4
Spanish	,,	5	,,	4
Campines	,,	5	,,	4
Buttercups	,,	5	,,	4
Anconas	,,	5	,,	4
Hamburghs	,,	4	,,	3

Heavy Breeds.		lb.		lb.
Orpingtons	Cockerel,	7	Pullet,	5
Plymouth Rocks	,,	7	,,	5
Rhode Island Reds	,,	7	,,	5
Sussex	,,	7	,,	5
Langshans	,,	7	,,	5
Wyandottes	,,	6	,,	4½
Any other variety	,,	7	,,	5

SCALE OF POINTS.

Standard Points.	Maximum Points.
Type	20
Colour (plumage and lobes)	7
Legs and feet (colour)	3
Condition	5
Laying Characteristics.	
Conformation (indicating stamina and capacity)	20
Freedom from coarseness	5
Head	7
Eyes	7
Face	3
Comb and wattles	5
Neck	3
Skin and abdomen	5
Plumage	5
Weight	5
Total	100

DISQUALIFICATIONS.

Under weight.
Any indications of impurity of breed.
Wrytail.
Dubbing or faking.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bankstown.

Mr. W. Grant, Superintendent of the Outer Domain, Sydney, gave a lecture on rose-growing before this branch on 26th November. Subsequently a rose show was held by the branch, and was judged by Mr. Grant.

On 3rd December the Assistant Fruit Expert, Mr. W. le Gay Brereton, gave a lecture on spraying, which was illustrated by lantern slides.

Bimbaya.

The monthly meeting of this branch was held on 6th December, when a number of suggestions for increasing the usefulness of the organisation were discussed.

It was decided that each meeting be limited to the consideration of one subject as formerly, but that each member be invited to contribute to the discussion. Contributions may take the form of newspaper clippings, extracts from books, or original matter. This procedure promises to greatly facilitate discussion, and will assist in assembling information useful to the branch. All printed matter received in the form of clippings will be classified and placed in a scrap-book.

It was further decided that parcels of books be obtained from the Public Library, Sydney, and issued to members.

Mr. T. Heffernan read a paper, of which the following is a summary:—

DROUGHTS, AND HOW TO PREPARE FOR THEM.

In earlier times in Australia it was the custom in dry periods to move cattle to relief country. But the possibilities in this direction were limited. Even if railway lines were much more numerous nowadays many obstacles would still remain. Many valuable flocks and herds had, however, been saved by this means.

Owing to the somewhat isolated position of the Bimbaya district, the problem was how best to provide for cattle at home. The removal of milking cows to relief country did not seem practicable on a large scale. The great tendency to depend upon the seasons and the natural pastures meant that in good seasons one-half of the grass was wasted, which showed that with normal stocking the pastures were not deficient, but that owing to the difficulties in the way of conservation, enormous quantities of fodder went to waste in times of plenty.

The increased value of stock made it incumbent on farmers to adopt means for their preservation. In rich districts such as theirs, much larger areas might be devoted to drought-resistant crops, such as lucerne. Not only did this plant supply abundance of fodder for immediate use, but the feed could be conserved more advantageously in the form of hay than many other fodders, owing to its immunity from the ravages of rats and mice. Sufficient lucerne had been grown throughout the district to prove the suitability of both soil and climate.

Another method of making provision against droughts—indeed, an increasingly essential factor in dairy-farming and in every other branch of farming wherein stock were kept in large numbers—was the silo. Silage possessed many advantages over hay. It could be more cheaply made and offered a wider choice of crops. Its successful manufacture did not depend, as in the case of hay, upon a succession of fine days, but could be proceeded with in all weathers. Moreover, it would keep for an indefinite period, and thus tended to add stability to dairy-farming operations. The Department of Agriculture had a useful bulletin on the subject.

Cotta Walla.

A meeting was held on 3rd January, at which Mr. C. Gilby read a paper on wool-classing for small farmers.

Jilliby-Dooralong.

On 3rd December Mr. F. Wigan, Dairy Instructor, gave a lecture before this branch on the selection of dairy cattle. He also gave a lecture in the evening to thirty members of the branch on dairying generally, dealing chiefly with the matter of making the farm profitable with well selected cows, by careful handling, feeding, &c. Mr. Wigan urged upon members the importance of testing and culling their herds, pointing out the necessity for maintaining a high standard of quality in the cream supply. The various causes of inferior quality in cream and the most improved methods of preventing contamination were carefully explained.

Lidcombe.

Mr. W. le Gay Brereton, Assistant Fruit Expert, gave a lantern lecture on spraying on 17th December.

Middle Dural.

Mr. L. Gallard, Fruit Inspector, gave a lantern lecture on fruit pests on 17th December. In addition to the lantern views, three large cases of specimens were exhibited, an instructive evening being the result.

Moss Vale.

A meeting was held on 28th December, at which Mr. W. H. Ruffles read a paper, of which the following is a summary:—

VEGETABLE-GROWING IN THE SOUTHERN DISTRICT.

Assuming that the soil is already prepared by deep cultivation, manuring, &c., we can at once deal with the question of local production of vegetables for home use under intense cultivation, as well as on larger areas, the produce from which is to be sold. The lecturer strongly urged that each person should grow his own seed, his main reason being that in that cold climate one could probably grow better seed than what could be purchased. In that district there was only one main season on which they could safely rely for sowing—from mid-spring to midsummer. The methods of planting the various kinds of vegetables, together with the care of same, were discussed. The growth of the White Belgian and Orange Giant carrot was strongly advocated, they being excellent for the table and good for fodder, besides being heavy croppers under adverse conditions, although of no marketable value, as the carrots lacked the required colour. In cabbages, he recommended the Short-stem Drumhead, Succession, and Savoy Drumhead varieties. Pumpkins, marrows, and tomatoes should be started early in 3-inch pots under cover, as they then gained considerable time.

Quaker's Hill.

A meeting was held on 28th December, at which three of the members—Messrs. Nichollas, Pye, and Cumming—gave demonstrations of budding. The demonstrations were accompanied by explanations, and at the conclusion a number of questions were answered. Some of the members exhibited some very fine samples of vegetables.

Tennyson (North Richmond).

The monthly meeting of this branch was held on 1st December at Mr. L. H. Parker's residence, Tennyson. Considering the weather, the attendance was good.

The meeting discussed the question of marketing fruit, and a committee was appointed to formulate a scheme for the co-operative disposal of fruit and vegetables in the Sydney market.

At a meeting held on 5th January, Mr. V. McMahon read a paper, from which the following paragraphs are taken. Mr. McMahon grows peas on an extensive scale.

PEA-GROWING IN THE KURRAJONG DISTRICT.

Peas may be grown in almost all Kurrajong land, but there are only certain slopes or aspects where they will grow successfully during the months of June and July. Generally speaking, these are the easterly and north-easterly slopes—the latter being most suitable, though there are some such slopes in Kurrajong where the frost is very severe and where winter peas cannot be grown. The balance of Kurrajong land is most suitable for spring and autumn crops ; it is not advisable to grow them during the hot summer months, though there may be a few low spots where they may be grown in the summer.

If a winter crop is to be grown on land for the first time, the soil need not be worked too deep, as a great supply of moisture is not necessary, there being more loss on account of too much moisture than from dry weather. After a light ploughing for the first crop, fresh land may be turned up for the second crop by ploughing a little deeper, and so on for each following crop. However, if the crop is to be grown in the warmer months, the ploughing must be deeper to retain the moisture. The land should be worked down fine, and should have time to sweeten before the crop is sown. Should rabbits be plentiful, the enclosure will have to be made rabbit-proof.

In my opinion, the varieties most suitable to Kurrajong are Yorkshire Hero, Senator, and American Wonder. Other varieties experimented on by me are Stratagem, Magnet, Sherwood, and Greenfeast. The seed should be secured from a reliable firm of seedsmen. Looking for cheap seed is not advisable, for the seed is to the crop as the foundation is to a building. Yorkshire Hero is most prolific, the harvesting extending over a longer period than with other varieties. Sometimes four or five pickings may be taken from the one bed if pickers are careful. I would give Senator next place for autumn and early spring, but it makes too much vine for winter crop. American Wonder, Greenfeast, Magnet, and Sherwood are early varieties, the first-named having preference for its yield, and the others are also placed according to merit. The last, though it bears a pod with splendid colour, does not weigh well, the pod being rather puffy. Magnet bears a pretty little pod, fills very tightly, weighs well, and will easily bring 1s. per bushel more than Yorkshire Hero. My trial with Stratagem was a failure. It was a wet season, and the vines grew about 5 feet long and yielded 20 bushels from an acre, while Yorkshire Hero yielded 100 bushels under the same conditions.

The autumn crop should be sown in January and February in order that it may mature in ten to twelve weeks. The winter crop should be sown in March. This crop takes much longer to mature, and the later the planting the longer it takes. Sown first week in March, the crop will be ready in fourteen to sixteen weeks, and if sown the last week in March it will perhaps take eleven to twenty weeks. The spring crop should be sown in April, May, and June. Sown the first week in April it takes the crop about twenty weeks to mature, and from this time on the plantings do not take so long. May planting takes about sixteen to eighteen weeks, and June about twelve to fourteen weeks. So that April to June plantings mature within a few weeks of each other, as the April planting goes almost through the winter without blooming.

For the autumn and winter crops I drill from east to west if possible. The blossom will then come on the northern or sunny side of the row and have the sun, which is most necessary to mature the crop at that time of the year. The drills should be from 2 feet 6 inches to 2 feet 9 inches apart, and the seed should be sown as evenly as possible from 2 inches to 3 inches deep, allowing from 1 bushel to 1½ bushels per acre. The seed does not require much moisture to germinate, and a great fall of rain after planting in the cold months is likely to rot it. A machine may be used to plant the seed and manure, and with a smart horse 2½ acres per day may be sown. I have always used bone-dust as a fertiliser—about 4 cwt. to the acre. The plants will be showing above ground in from seven to fourteen days, according to the time of year and condition of the soil. After three or four weeks a small cultivator should be used to move the soil, and then when the first blossom is noticed they may be tilled with a cultivator with mould-boards attached. As a rule this is all the cultivation necessary, though in the case of stiff land or when weeds are prevalent they will need more attention.

As the pods mature they should be watched closely, and when they are nicely filled and the pod is still green and seeds tender they should be picked. This is where the grower with his own family to pick has the advantage, for peas picked at the right stage, with no old or flat ones, will realise from 1s. to 2s. per bushel more than a mixed sample. It is advisable to place peas on the market as fresh as possible, and in small bags of an open texture.

The greatest yield I have had is 208 bushels from an acre of Yorkshire Hero peas. This particular acre was part of an 8-acre patch. After planting 7 acres rain came on and stopped planting, and four or five days afterwards the last acre was planted with the same seed and manure, yet the crop on this patch was quite conspicuous, the other part yielding from 125 to 150 bushels per acre. The whole of the 8 acres was virgin soil the previous year, and it had had a crop of oats grown on it. I have grown 650 bushels on 4 acres after a crop of oats has been sown on virgin soil. While an average of 100 bushels to the acre for 50 acres is quite possible, I would say that 80 bushels is a very good average for a period of ten years, and to maintain this average fresh land must be available after the third crop. After growing peas in the same land for about three years it becomes what is commonly called "pea-sick"; where the land is very rich and loose the crop will go to vine; and where it is poor and stiff the vines will die after growing a few inches.

The market for peas fluctuates a great deal, but to take it on the whole for large areas and for a number of years, 5s. 6d. is about the average on the market, or 5s. at Richmond. The past season has been an exception, the price being much higher. Of course, these remarks have applied chiefly to large areas, but greater results may be achieved from small plots by staking or trellising. The latter may be done by running three very fine wires on stakes driven about 12 feet apart. There is plenty of scope for experimenting in pea-growing in Kurrajong. It would be valuable to know how to renew soil that has been cropped for a number of years; and also the better varieties, of which there are many that have not been tried in Kurrajong.

Valla.

At a monthly meeting held on 17th December, a discussion took place on insect pests. The Chairman exhibited a number of orange branches infected with different scale pests, and Mr. England explained to members the different scales infesting fruit trees in the district, and the different sprays which he employed to treat them. Mr. England also dealt with other insect pests, and a highly interesting discussion followed his address.

The branch has decided to exhibit a collection of farm produce at the Bowraville show.

Woonona.

A meeting was held on 11th December, when Mr. Perkins read an interesting paper on chrysanthemum culture, describing the method of propagation and the growth of the plant for exhibition purposes. Subsequently Mr. Geo. Fowler spoke of some of the diseases of flowers and outlined methods for their treatment.

A special meeting was held on 2nd January in order to make arrangements for the branch's second annual show.

Orchard Notes.

FEBRUARY.

W. J. ALLEN.

Harvesting.

PICKING, packing, and preparing fruit for market will no doubt be the most important work at the present time. There still appears to be a greater necessity for more careful attention to packing and grading. With the markets heavily supplied, poorly packed and badly graded fruit must prove a source of loss. Zante currants may be picked and dried this month; also pears, such as Williams. The later peaches, plums, and prunes will be ready for harvesting.

Fumigation.

While this is considered one of the best months for carrying out this work, under no circumstance should it be done if the trees are out of condition through lack of moisture in the soil. A tree suffering from drought, or want of cultivation, can be easily damaged by either spraying or fumigating. Fumigation should be carried out at night, or during the cool part of the day, always avoiding hot days. During recent years we have carried out fumigation work in March and April, so as to avoid the hot weather of February. This seems to have been satisfactory, and the scale has been killed, and the trees kept free from damage.

Cultivation.

This work must still enter into the orchardist's programme. Weeds have to be kept down, and the land maintained in a state of good tilth. The soil should be worked regularly and thoroughly with spring-tooth cultivators, so as to conserve as much moisture as possible. In citrus orchards, where good rains have fallen, it is now a good time to plough. On steep hillsides, and where land is liable to wash, shallow ploughing, left in the rough, seems to be the best practice.

If cultivation be neglected, weed growth will become excessive. Provided, however, the plough be used before the weeds become too rank, the addition of the humus (organic matter) obtained from the weeds is an advantage to the soil, and also helps in preventing erosion.

Diseases.

San José Scale, Codlin Moth, Fruit Fly, Woolly Aphis, and scale insects of citrus trees, are the principal insect pests which require attention this month. Growers in doubt as to any disease attacking their trees, should either communicate with their district Fruit Inspector, or forward specimens to the Department of Agriculture without delay. The necessary treatment for the above diseases is published in bulletin form, and may be had free upon application.

Manuring.

It has been found in the coastal districts that this month is a suitable time to apply artificial manures to citrus trees, especially where the trees have received a good supply of moisture.

Irrigation.

Dry seasons occur at intervals in our coastal districts. The result is that very often bearing citrus trees suffer considerably, causing them to drop their fruit. Some experienced growers have installed small pumping plants, with a view to supplying the necessary moisture when dry periods prevail. One cannot too highly commend this procedure, as for a very long time there has been need of overcoming the difficulty of protracted dry weather. Trees or vines which have not had an application of water for some time will, in all probability, require one this month, in districts where there has been no recent rain. In applying water, the land should be well soaked to a good depth, and immediately the soil is dry enough, the cultivator should be put at work and the land well stirred by at least two cultivations after each irrigation.

Cover Crops.

The sowing of cover crops appears to be a satisfactory means of increasing the organic matter in many of our lighter coastal soils. Arrangements should now be made to procure seed for sowing and to prepare the land. No doubt there will be some difficulty experienced in obtaining such seed as vetches and other legumes, unless provision be made immediately. Fruit-growers are, however, not confined to legumes, as Skinless barley, rye, and rape are satisfactory for turning under.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

Society.	Secretary.	Date.
Coramba District Agricultural Association	H. E. Hindmarsh	Feb. 13, 14
Central Cumberland A. and H. Assocn. (Castle Hill)	H. A. Best	,, 15, 16
Wyong Agricultural Association	W. Baldwin	,, 22, 23
Dapto A. and H. Society	J. J. Cook	,, 20, 21
Guyra P., A., and H. Association	P. N. Stevenson	,, 20, 21
Manning River A. and H. Association (Taree)	L. Plummer	,, 20, 21
Alstonville A. Society	C. D. McIntyre	,, 26, 27
Yanco Irrigation Area A. Society	F. E. Harrison	,, 26, 27
Bangalow A. and I. Society	W. H. Reading	,, 26, 27
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 26, 27, 28
Moruya A. and P. Society	H. P. Jeffery	,, 27, 28
Robertson A. and H. Association	R. Graham	,, 27, 28
Dorrigo and Guy Fawkes A. Association	R. R. Blair	,, 27, 28

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

Society.	Secretary.	Date.
Gunning P., A., and I. Society	S. A. Beer	Feb. 27, 28
Inverell P. and A. Association	J. T. Dale	,, 27, 28; March 1
Newcastle A., H., and I. Association	E. J. Dann	Feb. 27, 28; March 1, 2
Tenterfield P., A., and H. Society	R. G. White	Mar. 5, 6, 7
Tamworth P. and A. Association	J. R. Wood	,, 5, 6, 7
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 5, 6, 7
Bega A., P., and H. Society	H. J. B. Grime	,, 6, 7
Braidwood P., A., and H. Association	L. Chapman	,, 6, 7
Tumut A. and P. Association	T. E. Wilkinson	,, 6, 7
Bellinger River A. Association	J. F. Reynolds	,, 6, 7
Cooma P. and A. Association	C. J. Walmsley	,, 6, 7
Crookwell A., P., and H. Society	M. P. Levy	,, 7, 8
Berrima District A., H., and I. Society (Moss Vale)	J. W. Kenny	,, 7, 8, 9
Wollongong A., H., and I. Association	W. J. Cochrane	,, 7, 8, 9
Queanbeyan P. and A. Association	J. G. Harris	,, 12, 13
Glen Innes & Central New England P. & A. Assocn.	G. A. Priest	,, 12, 13, 14
Cobargo A., P., and H. Society	T. F. Kennelly	,, 13, 14
Bombala Exhibition Society	P. J. Jonas	,, 13, 14
Nambucca A. and H. Association	M. Wallace	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 13, 14
Camden A., H., and I. Society	A. E. Baldock	,, 13, 14, 15
Goulburn A., P., and H. Society	H. C. Fraser	,, 14, 15, 16
Armidale and New England P., A., and H. Assocn.	A. H. McArthur	,, 19, 20, 21, 22
Nimmitabel A. and P. Association	O. E. Silk	,, 20, 21
Gundagai P. and A. Society	C. D. Asprey	,, 20, 21
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 20, 21, 22
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 20, 21, 22
Delegate P. and A. Society	F. H. Mullane	,, 21
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 26—Apr. 3
Walcha P. and A. Association	S. Hargrave	,, 27, 28
Bathurst A., H., and P. Association	S. V. Turrell	April 10, 11, 12
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 10-13
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 17, 18
Clarence P. and A. Society (Grafton)	G. N. Small	,, 17, 18
Batlow Agricultural Society	C. S. Gregory	,, 23, 24
Dungog A. and H. Association	W. H. Green	,, 24, 25, 26
Dubbo P., A., and H. Association	F. Weston	May 1, 2
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 9, 10, 11
National A. and I. Assn. of Queensland (Brisbane)	J. Bain	Aug. 12-17
Corowa P., A., and H. Society	J. D. Fraser	,, 20, 21
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 27, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 3, 4
Grenfell P., A., and H. Association	G. Cousins	,, 3, 4
Ganmain A. and P. Association	T. S. Henderson	,, 10, 11
Young P. and A. Association	T. A. Tester	,, 10, 11, 12
Cowra P., A., and H. Association	E. W. Warren	,, 17, 18
Temora P., A., H., and I. Association	A. D. Ness	,, 17, 18, 19
Yass P. and A. Association	E. A. Hickey	,, 26, 27

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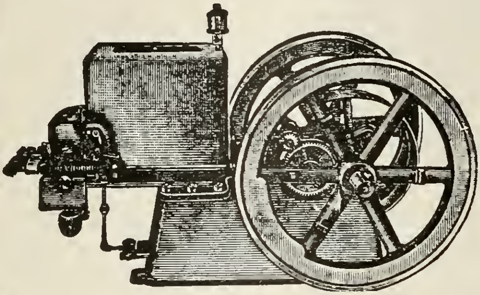

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2nd March, 1918.

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A CROP WHICH WILL FIND READY SALE FOR HOME CONSUMPTION AND WILL BRING PROMPT RETURNS ——————!

MALTING BARLEY

(Two-row and Six-row).

Why Not Sow Some Next Season?

Write to the Department of Agriculture for *Bulletin* 112; or, for further particulars, to—

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Vol. XXIX. Part 3. MARCH 2, 1918

Agricultural Gazette of New South Wales.

Water on the Farm.

[Continued from page 81.]

F. B. GUTHRIE.

UTILIZATION OF BORE WATER.

The best method of utilizing bore water which is impregnated with saline matter is a difficult problem for the irrigator, especially when this is the only water available.

The difficulty is particularly great in arid or semi-arid districts where such water mostly occurs, for the reason that the amount of irrigating water is less than the annual rainfall in humid climates. The result of this is that irrigation in such cases does not leach the soil as is the case in humid regions, so that the accumulation of saline water at or near the surface is actually increased with the increase in the quantity of such water used for irrigation.

The trouble is further intensified by the fact that the country on which this saline bore water is applied is, as a rule, plain country where drainage is difficult or impracticable, so that the salt-charged water penetrates only to a certain depth and returns upwards by capillarity through the soil, carrying with it the saline matter in solution, which it deposits at the surface. If it were practicable to subdrain, it would be possible to prevent this continual upward passage of the water, and to carry most of it away into the subsoil; but such an undertaking is not practicable over large areas of flat, low-lying country, and would entail enormous expense. The trouble could also be minimised if it were possible to leach out the salts periodically with fresh water, but this also is not possible; and unless the rainfall is sufficient to bring about this leaching process, the accumulation of saline matter proceeds continuously, and is, indeed, the greater the more of this salt-bearing water is applied. The trouble is not so great in the case of sandy soil, particularly soils with a pervious subsoil; but in clayey soils and in soils with impervious subsoils, the accumulation of salts proceeds with certainty, and is only accentuated by the use of larger quantities of irrigation water.

Remedial Measures.

As drainage is generally out of the question, the aim of the irrigator is to prevent, as far as possible, this undue surface evaporation, or, in some cases, to apply correctives to the water or the soil.

Quantity of Water.—When irrigating with saline bore water, excessive waterings must be avoided, and quantities such as are used in irrigating with fresh water will soon have an injurious effect for the reasons stated above. These notes deal only with the nature of the water available on the farm, and the effect on soil, stock, &c., of variations in its composition, so that no description of irrigation methods will be attempted. For methods of irrigation and quantities of water to be applied, other publications must be consulted. Speaking generally, such saline water should be used only on land which is well drained, either naturally or artificially, and properly graded; it should be used in moderate quantities at a time, only sufficient to keep the soil from becoming dry, and on no account should it be allowed to lie on the surface and evaporate. For all these reasons a system of frequent furrows and sluices is best, and the land should not be flooded, or the surface will rapidly become compacted and hardened.

Mulching.—The best means of preventing undue evaporation is by mulching. A soil mulch is found to provide a satisfactory method of reducing evaporation. The soil is lightly harrowed after each watering (also after each fall of rain) so that the surface is always in a fine, loose tilth, and surface compaction is avoided. This loose soil-mulch hinders the upward flow of water to the surface, and at the same time keeps the land sweet.

If practicable, a surface dressing of stable or compost manure, straw, or other organic material provides an excellent mulch, which has the advantage over a soil mulch that it does not require such constant stirring; and provides, in addition, a supply of vegetable matter for the formation of humus, which is nearly always deficient in soils charged with alkali, and which is constantly being burnt out of the soil by the action of the alkali in the bore water.

Green-manuring.—The ploughing under of a quick-growing green crop has the same effect, and is often the most economical and efficacious means of supplying the surface soil with vegetable matter. This is especially the case in orchards, where a green crop can be grown regularly between the rows of trees and ploughed under, thus providing a good mulch over the whole area and enriching the soil at the same time with humus.

Choice of Crops.—Deep-rooted crops, with plenty of leaf-space, are the most suited for irrigation with alkaline water, the deep roots rendering the plant independent of the saline water at the surface, whilst the leaves shade the surface and thus prevent excessive evaporation

Certain crops have been found to resist the action of alkali better than others.

The following is said, roughly, to be the order of endurance for alkali of fruit trees according to Hilgard:—Grapes, oranges, olives, pears, almonds, prunes, figs, peaches, apples, apricots, lemons, mulberries.

Chemical Ameliorants.

There is, unfortunately, no substance which will remove common salt from water, so that water highly charged with this substance cannot be improved except by distillation. Fortunately there is less danger of the accumulation of salt than of other mineral substances, since salt is extremely soluble and is not so readily absorbed by the soil. It is, consequently, more easily leached into the subsoil; and on soils which are efficiently drained, any surface deposit of saline matter which may be formed will contain proportionately less common salt and more alkali than the water from which it was produced.

Gypsum.—Of the different substances suggested for the removal or partial removal of alkali, gypsum has been found to be the most efficacious, and it is possible largely to counteract the bad effects of carbonate of soda by the addition of powdered gypsum, either to the soil itself or to the water before it is run on the land. Its action on carbonate of soda is expressed as follows :—

$$\underbrace{\text{Sodium carbonate}}_{\text{Alkali.}} + \underbrace{\text{Calcium sulphate}}_{\text{Gypsum.}} = \text{Calcium carbonate} + \text{Sodium sulphate.}$$

Of the substances produced as the result of the reaction, calcium carbonate (or carbonate of lime) is one whose presence is highly beneficial to plant-growth, and it is this compound which is present in soils rich in lime. It is the substance that occurs naturally as limestone, chalk and coral, and its presence in the soil is a sign of fertility. The other compound, sodium sulphate, is not entirely harmless if present in any considerable quantity, but is very much less harmful than carbonate of soda, and has no caustic action. The amount of gypsum to be added will depend upon the amount of alkali originally in the soil. Theoretically it requires 128 parts of gypsum to convert 100 parts of carbonate of soda into carbonate of lime and sulphate of soda. If applied to the soil, a dressing on the average of about 6 cwt. per acre of powdered gypsum is found to be beneficial. This dressing will, of course, have to be repeated when the land becomes alkaline again from further watering.

If added to the water, it is best done by placing it in boxes in the irrigation sluices at frequent intervals, so that the water has to pass over it.

If the water is pumped up into a storage reservoir the gypsum may be conveniently added to the water in the reservoir.

The neutralising effect of gypsum on alkaline bore water is well shown by the following experiment, carried out by Mr. C. R. Barker, of the Chemist's Branch of the Department.

A quantity of water from the Pera Bore, which has an alkalinity of 35·28 grains carbonate of soda per gallon, was treated with powdered gypsum at the rate of 28 lb. gypsum to 400 gallons water for several days.

The following table shows the diminution of the alkali :—

	Alkalinity calculated as carbonate of soda.
Original water...	35·28 grains per gallon.
After 1st day	19·60 ,, ,,
,, 2nd ,, ...	17·08 ,, ,,
,, 3rd ,, ...	14·49 ,, ,,
,, 4th ,, ...	13·93 ,, ,,
,, 5th ,, ...	11·76 ,, ,,
,, 6th ,, ...	10·92 ,, ,,
,, 8th ,, ...	6·23 ,, ,,
,, 9th ,, ...	5·60 ,, ,,
,, 10th ,, ...	5·25 ,, ,,
,, 11th ,, ...	5·18 ,, ,,

It will be seen that after 24 hours nearly half the alkali had been neutralised, after which the reduction was very gradual.

Water for Stock.

The question of the suitability of water for stock differs from the previous question of its suitability for irrigation in several particulars. Whilst it is desirable that the water should be as pure as possible, the nature of the impurities, and particularly what impurities are prejudicial, are not the same in both cases.

Lime Salts.—Though, in a general way, a pure water is the best, the presence of a certain amount of hardness due to lime salts is an advantage, and a slightly hard water is better for stock than soft rain-water, especially in districts where lime is lacking in the soil and, consequently, in the herbage or fodders. The presence of lime salts in the food is necessary for the production of bone, and where these are absent serious trouble may result, even in extreme cases producing a diseased condition which results in the complaint known as bone-chewing (see *Farmers' Bulletin*, No. 115, "Lime on the Farm," page 20). In such districts the water obtainable is also lacking in lime salts and is soft.

Magnesium Salts.—On the other hand, the presence of salts of magnesia, particularly of sulphate of magnesia, even in small quantities exerts a scouring action on stock. We have seen that in the case of irrigation it is only when magnesium salts are present in fairly large quantities, at least equal in amount to the lime salts, that the effect on the land or the crops is likely to be injurious. This is, however, not the case when the water is to be used for watering stock or for human consumption. Sulphate of magnesia is the substance known as Epsom salts, and while its presence imparts medicinal properties, which are valuable in certain cases, the continual use of an aperient water is good for neither man nor beast.

Half an ounce (218 grains) is a purgative dose for human beings, and 120 grains is purgative if given repeatedly.

So that in the case of a bullock consuming 9 gallons of water daily, a purgative dose would be provided if the water contained 14 grains per gallon (20 parts per 100,000) of magnesium sulphate or other soluble magnesium salt. This quantity is quite unusual. Indeed, in the analyses of bore-water published by the Mines Department, and already referred to on page 80 of the last issue, the presence of magnesium sulphate is not noted. Magnesium chloride is noted occasionally in quantities varying from 5 or 6 up to (in one instance only) 28 grains per gallon.

Magnesium carbonate is commonly present, but in much smaller quantities. Sulphate of soda (Glauber's salts) and sulphate of potash are also strong aperients. Sulphate of soda, when present, is generally in very small quantities; sulphate of potash is seldom present. In the case of sheep, which are calculated to drink about 1½ gallons per head daily, the amount of purgative saline matter which may be tolerated is even greater.

Common Salt.—The amount of common salt which animals can tolerate in their drinking-water is a difficult matter to determine.

Stock can be gradually accustomed to very brackish water if it is given to them in small quantities and if they avoid it when they are heated. Water containing as high as 500 parts per 100,000 has been reported as being taken by stock without ill effects. As the quantity of common salt in the ocean is about 3,000 parts per 100,000, it will be seen that the above is a highly brackish water. Pure water containing only a small proportion of common salt is brackish to the taste, though this brackishness may be masked to some extent by the presence of other dissolved matter, so that water containing a considerable proportion may not be appreciably brackish. Water containing excessive quantities acts as an emetic.

It will, therefore, be seen that the amount of common salt which is admissible in a water for stock is very much greater than in the case of a water to be used for irrigation, on account of the fact that unless the drainage is good the salt continues to accumulate, and a water containing only a moderate proportion of saline matter may finally deposit this in injurious quantities in the soil, whereas, in the case of stock, the action is not a cumulative one, and the amount which may or may not be present is determined by its palatability and the fact that it acts as an emetic.

Carbonate of Soda.—This is also a substance to which stock can accustom themselves to a greater or less extent. It has a purgative action when present in any quantity, but this action is very much less than in the case of magnesium salts.

When first watered with the water typical of most of the artesian bores, and containing about 50 to 60 parts per 100,000 of carbonate of soda (it is only in exceptional cases that this figure rises above 80), stock will be liable to scour slightly ; but if they are restricted in the use of it at first, and not allowed to drink when heated from driving, this scouring effect will only be slight, and they will soon accustom themselves to the use of such water without ill-effects. Human beings can soon drink water such as that from the Moree or Pera Bores (which contain about 50 parts sodium carbonate per 100,000) with impunity, and many people who have accustomed themselves to drinking bore water, express a preference to it over ordinary water.

(*To be continued.*)

SALE OF HOLSTEIN AND OTHER CATTLE FROM BERRY EXPERIMENT FARM.

THE Department has arranged with Messrs. Morton and Wright, 3 Castlereagh-street, Sydney, to conduct an auction sale of fourteen Holstein cows, six bulls, and seven heifers from the Berry Experiment Farm. The sale will take place at the Berry Sale Yards on Tuesday, 19th March, 1918, at 2 p.m. Any prospective buyers who intend inspecting the cattle before the sale are advised to travel by the evening train from Sydney on 18th March.

Full particulars of pedigrees and any other information required can be obtained from the Under Secretary and Director, Department of Agriculture, Sydney, or from the Auctioneers.

TREE PLANTING FOR FODDER PURPOSES.

WITH a view to encouraging pastoralists and farmers to devote a portion of their holdings to the growth of trees and shrubs that will provide fodder in times of scarcity, the Forestry Commissioners have announced their willingness to supply seedlings of certain kinds of plants suitable for the purpose to every grazier who is willing to comply with a few conditions that aim at ensuring that the trees shall have reasonable treatment.

A somewhat similar offer was made by the Forestry Department some two years ago, but the response from graziers was not very general. However, the importance of the subject is so great as to prompt the Commissioners to re-open the offer, and to put it before graziers in an ampler way. The result is a little booklet entitled " Tree Planting for Fodder, Shelter, and Economic Use," which sets out the conditions of the new offer, and also provides a brief description of the plants that can be supplied to applicants.

The Forestry Commissioners offer :—

1. To supply, without charge, sufficient fodder seedlings to plant, 20 feet apart, an area or areas of from 1 acre to 10 acres. The plants will be selected from the forest nurseries in different parts of the State, and forwarded by train to the railway station most convenient to the applicant.
2. To direct, supervise, and give advice regarding the planting and subsequent care of the plantations.
3. To set aside a sum of not less than £150 to be expended every three years in prizes for the best fodder plantations established under this scheme in the Central and Western Districts of New South Wales.

The selection will, for the present, be made from the following species at (so far as possible) the applicant's option, viz., Casuarinas, Kurrajong, Carob Bean, Tree Lucerne, and native Salt Bush.

In return for the free gift of the trees the Commissioners require that each participant shall undertake to comply with the following :—

1. To pay the cost of carriage by rail of the plants.
2. To plough the site for planting to as great a depth as possible, ready for the reception of the plants.
3. To enclose the plantation securely with stock and vermin-proof fencing.
4. To provide the cultivation and regular attention essential to the proper growth of the trees.
5. To take adequate precautions to protect the plantation against damage by fire.

Those interested should apply for particulars to "The Secretary, New South Wales Forestry Commission, O'Connell-street, Sydney."

Popular Descriptions of Grasses.

[Continued from page 41.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE FESCUE GRASSES.

Small-leafed Varieties.

The small-leafed Fescue grasses of agricultural value resemble each other very closely in botanical characteristics, and for this reason many botanists place all of them under one species, viz., *Festuca ovina.* For commercial purposes, however, they have been divided into different species, and these are:—

Festuca ovina (Sheep's Fescue). (Fig. 3.)
Festuca duriuscula (Hard Fescue). (Fig. 4.)
Festuca rubra and var. *heterophylla* (Red Fescue); and } (Fig. 5.)
Festuca rubra var. (Chewing's Fescue). }

The other fine-leafed Fescue of little agricultural value, and now naturalised throughout the State, is *Festuca bromoides,* commonly known as Rat's Tail grass, and sometimes as Silver grass. (Fig. 6.)

The small-leafed Fescues, as far as habits generally are concerned, are the very opposite to the wide-leafed Fescues described in a preceding issue of the *Gazette.* Whereas Giant Fescue and Meadow Fescue are wide-leafed, tall plants with large inflorescences, the small-leafed Fescues are small and tufted, and generally with wiry leaves and small inflorescences. The former might be termed in this country cattle grasses, the latter typical sheep grasses.

In Europe, New Zealand, and countries with similar climatic conditions, the small-leafed Fescues serve two purposes—they will grow on poor soils, and they act as bottom grasses to the larger growing kinds, such as Cocksfoot, on good soils. For such purposes they could be utilised much more extensively than at present in New South Wales. Fescue grass seed is imported by the Sydney seedsmen, but not in large quantities. For many of the good soils in the coastal districts Chewing's Fescue could well be included in the Cocksfoot-Rye grass mixtures to act as bottom grasses; while on the hard granitic soils such as exist in Bathurst district, and also on the hard clay soils of the Cumberland district, Sheep's Fescue and Hard Fescue have been known to produce results where other grasses have failed.

It is quite possible, however, that as the *Danthonia* grasses come into favour the latter will replace the Fescue grasses. The *Danthonia* grasses in New South Wales grow well on all classes of soils, and have been shown at Berry Experiment Farm to be far superior to Cocksfoot and Rye on badly-drained areas. As these grasses are native, and as the seed of two of them,

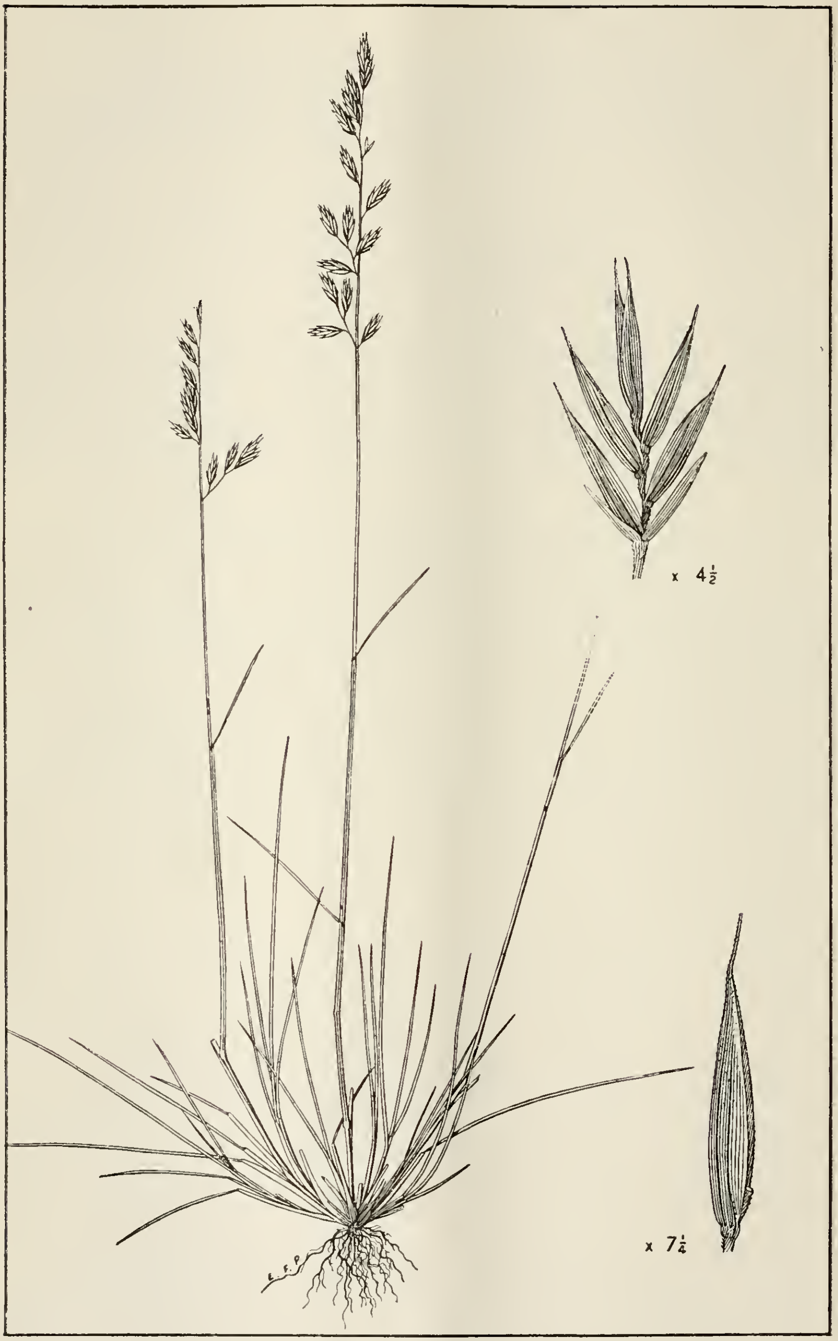

Fig. 3.—Sheep's Fescue (*Festuca ovina*).
Note that the spikelet is much smaller than that of *Festuca duriuscula* (Fig. 4).

POPULAR DESCRIPTIONS OF GRASSES.

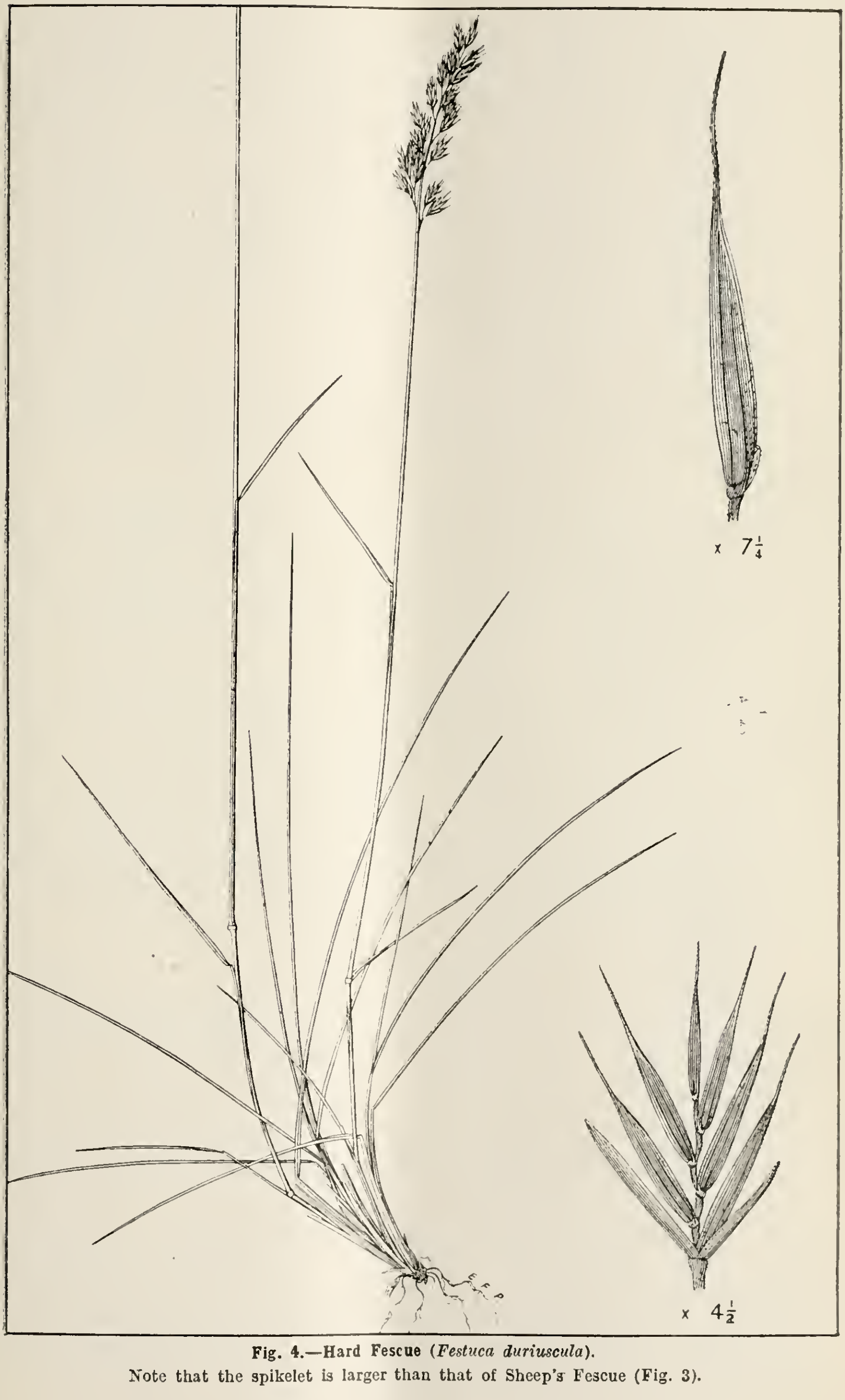

Fig. 4.—Hard Fescue (*Festuca duriuscula*).
Note that the spikelet is larger than that of Sheep's Fescue (Fig. 3).

POPULAR DESCRIPTIONS OF GRASSES.

viz., *Danthonia pilosa* and *D. semiannularis* are now sold by the seedsmen, dairymen may feel inclined to prefer these to the Fescue grasses. It is interesting in this connection to read the remarks of Mr. Cockayne, the New Zealand Biologist, who writes in the *N.Z. Agricultural Journal,* March, 1917:—

"The greater bulk of seed of Chewing's Fescue has been exported to Europe, where it has entered into successful competition with the Sheep's and Hard Fescue grasses of that country. At one time it was largely used in New Zealand, particularly for second-class land. The *Danthonia* grasses, however, have replaced Chewing's Fescue on poor soils, while Crested Dogstail has replaced it on good soils."

Sheep's Fescue.—All the small-leafed Fescues are sometimes grouped under this name, but there is no doubt, from an agricultural point of view, about the difference between the dwarf form of *Festuca ovina* on the one hand and the robust Chewing's Fescue on the other.

Sheep's Fescue is probably the smallest grass grown for agricultural purposes. It is a densely tufted little grass 6 inches to a foot high. It has very slender but firm leaves arranged at the base of the stem, with a short panicle of flowers about 3 inches long. Messrs. Sutton, of England, characterise this grass as having an angular culm, as distinguished from the round culms of the other cultivated Fescues, but this character does not appear to be constant.

Sheep's Fescue is of particular value for very poor soils, and also in lawn mixtures. It is not recommended for the good soils, and, indeed, the more vigorous grasses will crowd it out in such conditions.

Its value for dry and hard poor soils lies in its root system, which is remarkably developed for such a small plant. It could be well utilised for sheep pastures on dry, hilly country, where, if unsuitable for cultivation, the seed could be surface-sown. Following is the chemical analysis of this grass, supplied by Sutton:—

In Natural State.

	Per cent.		Per cent.
Water	55·62	Soluble mineral matter ...	1·59
Soluble albuminoids	1·06	Insoluble mineral matter ...	1·72
Insoluble albuminoids ...	1·54	Chlorophyll, soluble carbohydrates, &c.	6·44
Digestible fibre	16·72		
Woody fibre	15·31		

Hard Fescue Grass.—This is a larger grass than the last-named *Festuca ovina.* The seed is also larger, and the flower heads, when ripe, become decidedly hard (hence its name).

Like Sheep's Fescue, Hard Fescue may be considered a typical sheep grass. It can, however, be utilised as a bottom grass in permanent mixtures, as it is a fighting little grass and will more than hold its own in dry soils against such vigorous grasses as Cocksfoot and Rye. The seed is fairly cheap, but care should be exercised in obtaining seed of good germinating qualities.

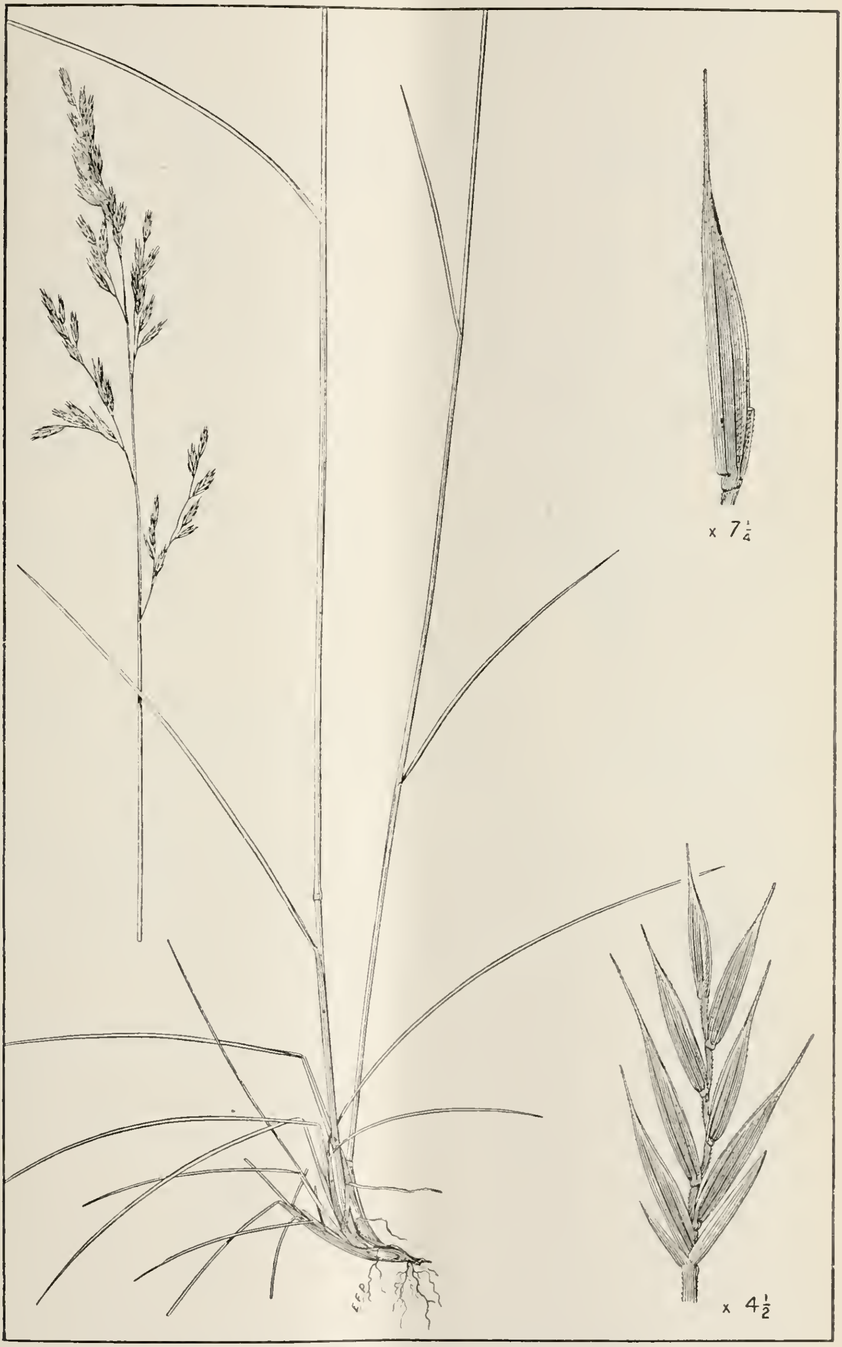

Fig. 5.—Red Fescue, Chewing's Fescue (*Festuca rubra*).

Note that the root is creeping, a characteristic feature of the grass. It is also taller than the others.

Following is Sutton's analysis of this grass:—

In Natural State.

	Per cent.		Per cent.
Water	61·98	Soluble mineral matter	1·52
Soluble albuminoids	·17	Insoluble mineral matter	·86
Insoluble albuminoids	1·50	Chlorophyll, soluble carbohydrates, &c.	4·25
Digestible fibre	6·53		
Woody fibre	23·19		

Note that amount of woody fibre in this grass is much larger than in that of Sheep's Fescue.

Red Fescue.—Both from a botanical and agricultural point of view, Red Fescue (*Festuca rubra and F. rubra* var. *heterophylla*) resemble each other so closely that it would be unwise to make any distinction.

Red Fescue is distinguished from Sheep's and Hard Fescue by its creeping roots, and also larger seed. The whole habit of the plant, too, is generally larger.

Red Fescue is a very palatable grass both for sheep and cattle, and it would even be a better bottom grass for good soils than Hard Fescue. Its creeping roots enable it to hold its own against the more vigorous grasses.

Following is Sutton's analysis of the *heterophylla* variety:—

In Natural State.

	Per cent.		Per cent.
Water	41·07	Soluble mineral matter	3·18
Soluble albuminoids	·31	Insoluble mineral matter	1·51
Insoluble albuminoids	2·13	Chlorophyll, soluble carbohydrates, &c.	7·78
Digestible fibre	17·81		
Woody fibre	26·21		

Chewing's Fescue.—This is a New Zealand variety, and appears the most important of the fine-leafed Fescues. It is the variety generally recommended by the New Zealand Department of Agriculture for the following situations:—(1) For surface sowing, mixed with *Danthonia,* after bush burns; (2) for sandy soils; (3) for light pumice soils; and (4) for the classes of soils in which Cocksfoot and Rye grasses are sown.

There is no doubt that Chewing's Fescue has a much more robust growth than the other fine-leafed Fescues, but, what is also important, its seed has far higher germinating qualities. In tests carried out at the Botanic Gardens, whereas Hard Fescue gave a germination varying from 15 to 20 per cent., and Sheep's Fescue 25 to 30 per cent., Chewing's Fescue gave results as high as 70 per cent.

Rat's Tail Grass or Silver Grass.—This is an extremely common grass on the tablelands, slopes, and semi-arid interior of New South Wales during the spring months. It is an introduced slender tufted annual, growing to a height of only a few inches on poor soils, and to fully 2 feet on rich soils. The grass, however, bears very little flag, and, when crowded as they are into hundreds of plants per square foot, consists mostly of stem and inflorescence. The latter varies from two or three spikelets to a dense

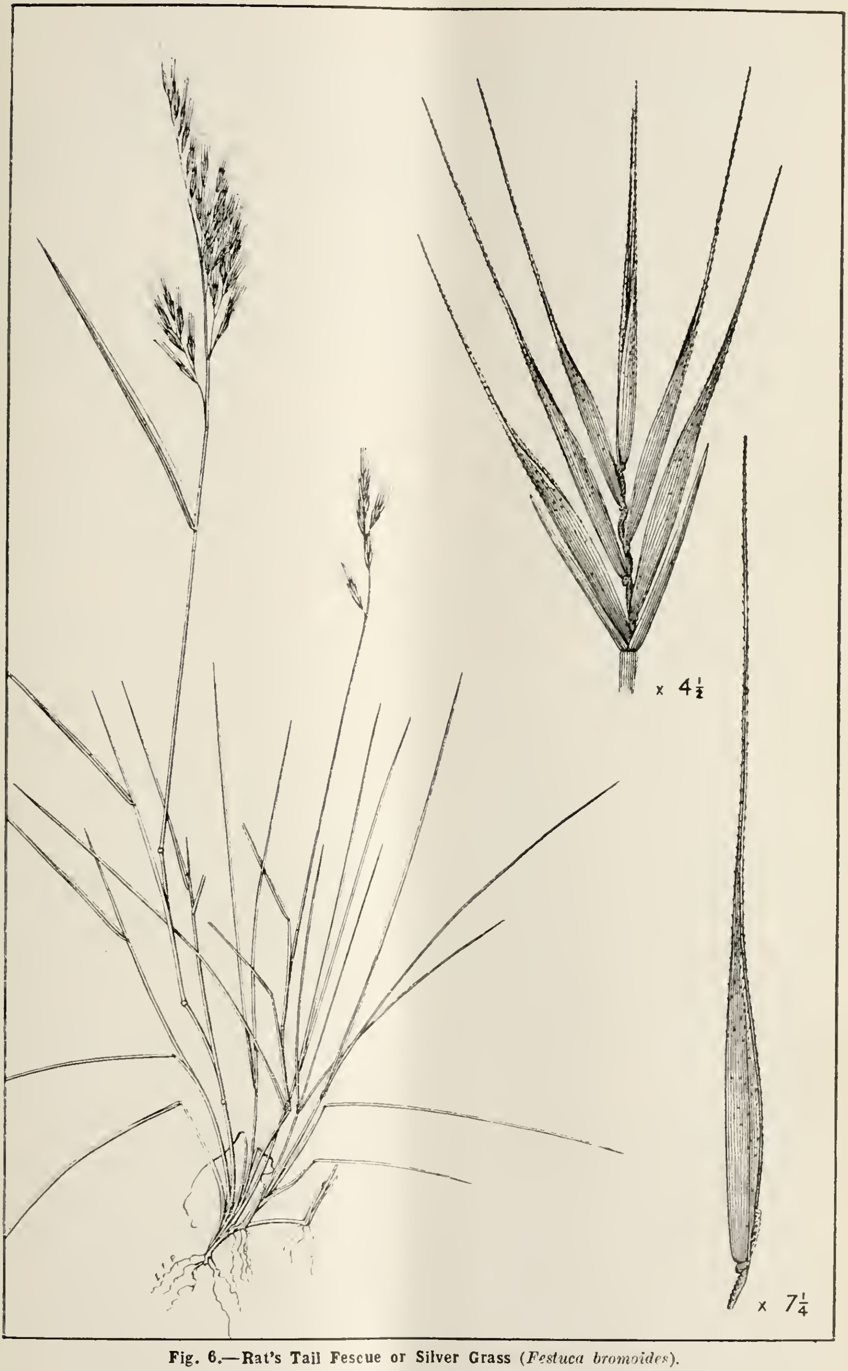

Fig. 6.—Rat's Tail Fescue or Silver Grass (*Festuca bromoides*).
Note the long awns or bristles attached to the spikelets.

Popular Descriptions of Grasses.

panicle (in good plants) fully a foot long. The flowering spikelets are very small, and can readily be distinguished from the fine-leafed Fescues previously described by the very long spear-like bristle or awn.

This grass is a native of Europe, whence it has been introduced into North America, Australia, and other countries. It has obtained a firm foothold in this State, and readily crowds out other grasses in the spring months. It is an extremely short-lived annual, setting its seed very quickly, thus ensuring its propagation the following year.

In rich soils it produces enough flag to provide a fair amount of feed during the spring, but, as herbage is generally plentiful during this season, the grass is generally neglected, the seed ripens and comes up more thickly than ever the following year. Following is the analysis by the Departmental Chemist:—

	Per cent.
Moisture	70·82
Albuminoids	4·13
Ether extract	1·20
Fibre	5·66
Ash	7·32
Nitrogen-free extract	10·87
Albuminoid ratio	1 : 3·3
Nutritive value	17·7

Elephant Grass on the Macleay River.

An interesting report has been received from Mr. E. Riddel, of Mount Pleasant Apiary, Stuart's Point, Macleay River, briefly outlining the results with this grass. One root and two slips were planted in heavy clayey soil close to water on 20th September, 1917, and a similar number on red chocolate soil on the same date. Those planted on the clay came up, but, as they were not attended to, did not make much progress.

On the chocolate soil the root only survived, and on 4th October three shoots were showing, increasing to sixteen on 28th December, of which nine measured 12 feet in height. On 28th January several were 16 feet high. Two stems were cut on 24th December and offered to a milking cow. Both were eaten from leaf to butt, and were apparently relished.

The Elephant Grass was planted at the end of a patch of Indian cane, which at that time was 10 or 12 inches in height, and now averages 9½ feet.

The only apparent objection to the fodder grass is that the stems and leaf butts are covered with long rough hair which may be harmful to stock.

The new grass will evidently thrive exceptionally well under Macleay River conditions, and is far ahead of "cane" so far as speed of growth is concerned, and Mr. Riddel intends laying out a bed as soon as possible for planting next spring.

Farmers' Experiment Plots.

WINTER FODDER EXPERIMENTS, 1917.

North Coast.

G. C. SPARKS, Assistant Inspector of Agriculture.

VARIETY and manurial trials with winter fodders were arranged for at eleven centres on the North Coast during the winter of 1917, the names and addresses of the experimenting farmers being as follows:—

F. T. Johnston, Condong.
G. A. Forrest, Coraki.
C. Oliver, Yorklea.
T. W. Savige, Old Bonalbo.
Jas. O'Keefe, Wooroowoolgen.
F. Allard, Brooklana.
Henry Short, Dorrigo.
E. A. Marsh, Macksville.
F. J. Giblin, Burrapine.
C. J. Rogers, Stuart's Point.
G. J. Ward, Sherwood.

Owing mainly to seasonal difficulties, returns were secured from only four centres, viz., Condong, Dorrigo, Burrapine, and Sherwood.

Season.

The winter was one of extreme severity, and the experiments were, on the whole, attended with the most disastrous results. In some cases there was at no time sufficient moisture in the seed-bed to allow a reasonable prospect of successful germination, while later on the growth was rendered inappreciable by the dry, frosty conditions obtaining after seeding. In the opinion of old and highly experienced farmers on the North Coast, few, if any, more rigorous winters have been known, and under the circumstances the results achieved at the four more favoured centres are gratifying.

Early maturity is an important consideration as regards a coastal fodder crop, but in the past season the earlier varieties were severely handicapped by having to complete their growth upon a rainfall of approximately 1½ inches. The copious rains of late September, however, caused a wonderful recovery by the various oat plots and slow-maturing wheats, and in consequence the results shown in Table A cannot be regarded as conclusive, the seasonal advantages being entirely with the later varieties.

Cultivation.

The preparation of the soil was practically identical throughout these trials. In every case the work was taken in hand early in the season, the previous crop residues being ploughed in and the fallow receiving all necessary attention. As a direct result of this, the seed-beds were all in splendid order. The seed was broadcasted at the rate of from 1¾ to 2 bushels per acre and harrowed in. Seeding was, on the whole, later than is advisable, various influences operating to delay the work, notwithstanding which a satisfactory germination was secured.

The Various Plots.

Sherwood.—This experiment was seeded on 21st May. It was on a sandy alluvial soil that had been utilised for the previous season's fodder experiments.

Here also was included a trial of fallowed land *versus* non-fallowed. The difference brought about by the two systems was clearly shown almost immediately. At all times the fallowed plots presented a healthy and pleasing appearance, and a glance at the figures in Table A will indicate that, in spite of seasonal difficulties, fair success was attained. On the non-fallowed land, however, the germination was very poor, and the growth extremely weak and of a very sickly yellow colour. The fallowed plots yielded at the rate of from 5 to 10 tons per acre, but nowhere on the non-fallowed plots was the crop of sufficient height to provide a sample for weighing.

On 7th September the Florence and Firbank wheats, the Black Winter rye, and the Canada field peas had reached maximum growth and were harvested. Up to this time 150 points of rain had been recorded since seeding. On 29th September the Thew and John Brown wheat plots were harvested, and although by this time the season had broken, the rain had come too late to influence the yield of these varieties. On 13th October the residue of the experiment was harvested, but by this time the effective rainfall had risen to 5·65 inches. The details of each experiment are practically identical, and it is therefore unnecessary to give more than a short description of the soil and general characteristics of the other plots.

Burrapine.—This experiment was on a sandy alluvial soil under cultivation for upwards of twenty-five years, rather badly infested with nut grass, necessitating constant attention to the fallow. A particularly fine seed-bed was secured, although the germination was not quite as good as at other centres. Seeding was done on 25th May. The rainfall was 4·62 inches.

Dorrigo.—This experiment was carried out on the typical deep, friable, red volcanic soil of the plateau—a soil of great fertility, but incapable of withstanding prolonged periods of dry weather. The plots were planted on 1st June, and the subsequent growth of all varieties was weak, with the notable exception of Black Winter rye, which, throughout the dry, cold weather, maintained a comparatively strong growth. Although the actual yield on this plot did not approach within measurable distance of the oat plots, the fact should be noted that a fair amount of fodder was produced under the most trying conditions, and it is regarded as likely to become a popular fodder crop in this district. The Dorrigo experiment was marked by the total failure of the early wheats and legumes, and by the fine recovery of the oats and the Cleveland and John Brown wheats.

Condong.—The soil of this experiment was a fairly heavy alluvial that has been under cultivation for over thirty years, being cropped mainly to maize and sugar-cane. Seeding was carried out on 7th May. The seed-bed was in a moist condition, and germination was excellent. At an early stage the Firbank wheat plot drew considerable attention on account of its rapid growth and robust appearance. The prevailing dry conditions speedily made themselves felt, and development was restricted as at other centres. Windstorms, followed by heavy rain, caused some damage late in the season. particularly to the plot on which Huguenot wheat and grey field peas were grown in combination. The rainfall was 4·64 inches.

Conclusions.

Wheat.—Experience has proved that Florence, Thew, and Huguenot are varieties of wheat most suitable for coastal conditions, and while other varieties have given good results during the past season, it is as yet too early to make definite recommendations concerning them. It should be noted, however, that Firbank made the most rapid growth of any crop included in the experiments, and there is every possibility that good results will follow its use. Being a non-stooling variety, it is advisable to make a somewhat heavier sowing than is usual with others. Where early winter feed is required, however, the use of Florence and Thew can be strongly advised. The former produced at Sherwood almost 7½ tons of green fodder in 111 days, on a rainfall of 150 points; while the latter, although slightly slower in maturing, is regarded as being a heavier yielder.

The real use of wheat on the coast would seem to lie in the direction of providing early winter fodder, and it appears to be unlikely that the late maturing wheats will compete with any great success against the different varieties of oats.

Oats.—It will be noted that the oat plots yielded most consistently. Ruakura has been well and favourably known on the coast for some seasons past, and is rapidly growing in popularity. Although outyielded on this occasion, the consensus of opinion amongst experimentalists is that it is a highly desirable variety and worthy of every attention.

Sunrise has proved itself a heavy yielder on the North Coast, but it is less popular than Ruakura, on account of its tendency to coarseness.

Guyra yielded up to within 3 cwt. of the Algerian plot at Dorrigo, and is worthy of extended trial there. In a normal season there is every possibility that the positions of these varieties would be reversed. During the dry period Guyra made much the stronger growth, and was relatively nearer maturity when the rain came.

Algerian is unquestionably the standard oat. In many centres its popularity is undiminished, although as they are becoming more widely known the new varieties are gradually replacing it on account of their hardiness and earlier maturity.

Rye.—There is a popular impression that rye produces an unpalatable fodder, but observations made during the past winter indicate that cattle eat it readily. It is regarded as being particularly hardy and drought-resistant, and is worthy of extended trial.

Legumes.—At Sherwood the grey field peas gave the highest yield on the experiment. It may be mentioned that at this centre field peas have become a very popular crop, and their cultivation cannot be too strongly recommended. Quite apart from their value as a fodder, their highly beneficial effect upon the soil is well known.

The difference in yield at Sherwood between the grey and Canada field peas is not as great as the figures indicate. The latter completed its growth under the driest conditions, and indeed was a stronger plant throughout than the former, which made most of its growth after the September rains. The Canada field pea has proved itself a particularly hardy variety, and has won favourable regard wherever introduced.

The mixture of Huguenot wheat with grey or blue field peas can be very strongly recommended. It has been grown with great success on these experiments, and on most occasions is one of the heaviest yielding plots. It is an interesting fact that at Burrapine, while the field pea plots were destroyed by wet, the Huguenot and field pea mixture was quite undamaged.

TABLE A.—Results of Variety Trials, North Coast, 1917.

	Condong.	Dorrigo.	Burrapine.	Sherwood.
Wheats—	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Cleveland	4 16	10 6¼	7 13¾	8 2¼
Firbank	5 16¼	.....	6 9¾	6 2½
Florence	6 4¾	......	7 4	7 8¾
Huguenot	2 17½	......	8 8	7 8¾
John Brown	4 1¾	10 10¾	12 0	7 7¾
Thew	6 0	......	8 8	6 19¾
Warren	4 6½	5 8	6 4¾	6 1¾
Oats—				
Algerian	9 16¾	15 3¾	9 12¼	7 13¼
Guyra	......	15 1	......	......
Ruakura	9 2½	12 6¾	9 12	8 16¾
Sunrise...	9 12	13 16¼	12 19¼	9 3
Legumes—				
Canada field peas	3 12	......	......	5 3½
Grey field peas	3 16¾	......	......	10 7¼
Huguenot wheat and grey field peas.	4 6½	......	14 8	7 13¼
Black Winter rye	3 7¼	8 16	9 12	7 2¼

Manurial Trials.

Experiments with manures were conducted in conjunction with the variety trials, with the exception of those at Condong.

The manures used and their cost per acre were :—

	s.	d.
Superphosphate, ½ cwt., per acre	2	6
,, 1 cwt. ,,	4	11
Bone-dust, 1 cwt. ,,	8	6
Superphosphate, ½ cwt. Nitrate of soda, ½ cwt. } per acre	13	6

As has been explained earlier, the season was a particularly disastrous one for early maturing varieties, and as these manurial trials were carried out with Thew wheat, which reached maturity before the coming of the spring rains, only at Burrapine and Sherwood were conditions sufficiently favourable for any appreciable growth to be made.

It will be understood that a fair amount of moisture is necessary before a crop can benefit by the use of artificial manures, and in a season like the past it is almost impossible to draw any definite conclusions from the results obtained, but it will be noted that at Burrapine good results followed the use of superphosphate, and it is more than probable that they would have been better under less adverse conditions. When it is seen that an increase of 3¼ tons was secured by the use of a manure costing less than 5s., the advisability of conducting further experiments along these lines will be readily appreciated.

At Sherwood the results are less pronounced, which tends to emphasise the fact that on the older soils the first need is for green manuring.

TABLE B.—Results of Manurial Trials, North Coast, 1917.

	Burrapine.		Sherwood.	
	tons	cwt.	tons	cwt.
Superphosphate, ½ cwt. per acre...	10	16	7	9½
,, 1 ,, ,, ...	11	14¼	7	4¼
Bone-dust, 1 cwt. per acre ...	6	19¼	7	17¾
Superphosphate, ½ cwt., and Nitrate of Soda, ½ cwt. per acre.	6	19¼	6	6½
No manure	8	8	6	19¾

South Coast.

R. N. MAKIN, Inspector of Agriculture.

THE following farmers co-operated with the Department in conducting winter fodder experiments during 1917 :—

T. A. Bateman, "Ireton Wood," Albion Park.
J. Timbs, "Tara," Albion Park.
J. Miller, jun., "Warrabank," Toolijooa.
J. Chittick, Kangaroo Valley.
L. Garrad, "Wickham Hill," Milton.
Superintendent, Boys' Farm Homes, Mittagong.
J. H. Martin, Pambula.
V. J. Collins, "Watoonga," Bemboka.

The returns from the early-maturing varieties of wheat are low; this may be accounted for by the exceptionally dry winter. The months of May, June, July, and August were all much below their average rainfall; and, to make matters worse, early frosts were experienced in most parts, and were frequent throughout the winter. Sowing started in April—being unavoidably late. The plots at Albion Park, Mittagong, Bemboka, and Crookwell were sown with the wheat drill; all the rest were broadcasted by hand.

The bad season was accountable for the failure of the plots at Mr. J. Timbs' farm, Albion Park, and Mr. J. Miller's, Toolijooa.

The seed was drilled in at the rate of 100 lb. of wheat per acre, and 75 lb. of oats per acre. Where Canada field peas were sown the seed was mixed with the wheat at the rate of 20 lb. per acre. Where the seed was broadcasted, 2 bushels per acre of wheat or oats were sown. Manures were sown by the drill at rate of 100 lb. per acre. At Mr. Bateman's farm, Albion Park, owing to the breakage of a cogwheel in the manurial attachment of the machine, the manure had to be broadcasted by hand. All varieties of wheat and oats were manured—superphosphate being applied at the rate of 1 cwt.

per acre—where the seed was sown by hand. The mixtures of manure applied in the manurial tests comprised P 5 (composed of superphosphate four parts and sulphate of potash one part) and P 7 (equal parts of superphosphate and bonedust mixed). P 5 was sown at the rate of 1¼ cwt. per acre and P 7 at 2 cwt. per acre.

The Soil and its Preparation.

The preparation of the soil was carried out by ploughing in January and cross-ploughing prior to sowing.

Albion Park.—Two plots were sown in this district owing to there being two distinct classes of soil—that at Mr. Bateman's farm being composed of alluvial deposit formed from sandstone, and that at Mr. Timbs' being open forest country of sandstone formation.

Gerringong.—The soil was of basalt formation.

Kangaroo Valley.—The soil here was of sandstone formation; second cropping of paddock broken up after a long spell.

Mittagong.—This also was of sandstone formation, the ground being flat, and receiving the wash from rather poor hills.

Milton.—The plots were on a hillside, the soil being of sandstone formation, of medium fertility.

Pambula.—This was on an alluvial flat formed from granite formation. The land had been under crop for many years.

Bemboka.—The formation here was raw granite; the ground was new, having just been broken up.

Varieties of Wheat.

Two varieties of wheat, Cleveland and Clarendon, were under test for the first time on the South Coast experiment plots, and both were found to be later in maturity than other popular varieties. Cleveland proved to be much later in maturing than any other variety that has yet been tried, and it may be put aside as an early fodder wheat. It was not expected that it would mature early, as it is known as a late-maturing wheat, but it was thought it would be wise to ascertain its value for coastal conditions. However, as oats may be obtained long before Cleveland wheat is ready for cutting, and as oats are preferred for green feed, that variety of wheat must stand down. Clarendon was neither earlier nor better in yield than the well-known Thew, Florence, or Firbank varieties, so it may also be disregarded in future.

Thew grew as well as ever under the weather conditions, and is still the most reliable wheat to grow on the South Coast. Firbank and Florence require better weather conditions in order to produce the high return they are capable of.

On plots where Canada field peas were sown in conjunction with wheat the results were satisfactory, the green fodder being of better value than where wheat was grown by itself. The practice of sowing mixed fodder crops is strongly recommended to farmers. At the present time Canada peas are not largely grown, but grey field peas are generally obtainable and may be sown instead. The Canada variety is earlier, and is recommended on that account. Ample supplies of this valuable variety should be available in a few years.

The Manurial Trials.

Unfortunately, we again did not get the results hoped for from the application of manure, due very largely to the season. The figures in the table do not convey altogether a correct impression, however, for in all cases artificial manure hastens the maturity of the crops, and very often we find that the unmanured section is quite green, whilst those that have been treated are showing signs of ripening. Again, it is found that manured sections are always more healthy. In most cases the manured sections returned an increase over the untreated. Taking superphosphate at £5 2s. 6d. per ton and bone-dust at £8 per ton, and applying them at the rates mentioned above, it will be seen that the expense was very small. Green fodder may safely be valued at £1 per ton for feeding dairy stock during the months of July, August, and September; it seems a low estimate for green feed, but most farmers are agreeable to pay that for it and also to sell it at that price under South Coast conditions. At Kangaroo Valley there was a difference in yield of 3 tons in favour of the manured plot, and the cost of the manure at the outside was only 7s. 6d., so that there was an apparent profit of £2 12s. 6d., and also a cleaner and earlier growth

At Pambula the untreated plot showed to the best advantage. A case such as this occasionally comes along, and is probably due to some former treatment of the soil of which we were not aware, or perhaps to the section being naturally better drained. The fact remains, however, that it pays to manure wheat and oats for green feed. Sulphate of potash is still practically off the market; until full supplies are available, little can be done in testing this valuable manure.

The Oats Trials.

An unusual occurrence was noted on several plots during the season. Sunrise and Ruakura varieties of oats matured earlier than any of the wheats. Such a thing has not been noticed before in the South Coast experiments. No doubt it was due to the season; but farmers will watch the returns of these varieties of oats compared with wheat with considerable interest, for we certainly have in them something worth growing for green feed. Sunrise on account of its earliness, and Ruakura because of its high yielding capacity and its earliness (second only to Sunrise), compare most favourably with other varieties that have been under test. Sunrise is a little coarse in the straw, which does not matter for green feed; but if kept for hay, it is not attractive. Ruakura, on the other hand, stools fairly well, is fairly fine in the straw, and makes up well into hay. The demand for these varieties is increasing every season, and for feeding off and for green fodder the slow-growing Algerian variety will soon give place to them. At Bemboka, where the rainfall was exceedingly light, the crops were very sparse. When the rain fell in the spring the grass came along rapidly, and the crops, not being required for green feed, were turned into hay.

SOUTH COAST WINTER FODDER PLOTS, 1917.

Wheat Variety Trials.

Variety.	Boys' Farm Homes, Mittagong.				J. Chittick, Kangaroo Valley.				J. H. Martin, Pambula.				T. A. Bateman, Albion Park.				L. Garrad, Milton.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Florence ...	6	5	2	24	1	17	2	20	4	14	1	4	3	0	0	0	3	10	0	0
Firbank ...	6	11	1	20	4	0	0	0	5	12	3	12	3	15	2	24	5	2	3	12
Cleveland ...	7	2	3	12	4	14	1	4	5	12	3	12	3	17	1	16	7	17	0	16
Thew... ...	6	14	1	4	5	13	2	8	4	15	0	0	5	10	0	0	4	18	2	8
Clarendon ...	....				4	2	3	12	4	7	0	16	....				....			

Wheat Manurial Trials.*

Manure.	Boys' Farm Homes, Mittagong.				J. Chittick, Kangaroo Valley.				J. H. Martin, Pambula.				L. Garrad, Milton.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate 1 cwt. per acre	6	14	1	4	7	9	1	4	4	15	0	0	4	18	2	8
P5 Mixture 1¼ ,, ,,	6	0	0	0	7	10	0	0	4	10	2	24	....			
P7 Mixture 2 ,, ,,	5	14	1	4	....				4	10	0	0	....			
No manure	5	1	1	20	4	10	0	0	5	2	0	24	4	2	3	12
Canada field peas, superphosphate 1 cwt. per acre ...	7	8	2	8	6	10	2	24	4	7	3	12	4	8	2	8

* Thew wheat was used throughout these trials.

Oats Variety Trial.

Variety.	Boys' Farm Homes, Mittagong.				J. Chittick, Kangaroo Valley.				J. H. Martin, Pambula.				T. A. Bateman, Albion Park.				L. Garrad, Milton.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Ruakura ...	6	7	0	16	10	10	2	24	7	12	0	16	6	2	3	2	8	15	2	24
Sunrise ...	6	7	0	16	9	8	2	8	10	0	0	0	7	4	1	4	6	2	3	12
Algerian ...	7	12	3	12	7	17	0	16	7	2	3	12	4	11	1	20	7	5	0	0

Hay yield at Bemboka.

	tons	cwt.	qrs.	lb.
Wheat—King's Early	1	0	0	0
Florence	0	18	0	0
Firbank	0	15	0	0
Cleveland	0	10	0	0
Thew	0	16	0	0
Oats—Ruakura	1	0	0	0
Sunrise	1	0	0	0
Algerian	1	5	0	0

Notes on the Test Plots at Cowra.

WHEAT VARIETIES.

J. T. PRIDHAM, Plant Breeder.

LIKE the previous season, the year turned out a disappointing one to many farmers who had sown the old Federation and wheats of the Purple Straw type. Those who had grown two or three sorts were in a better position than the grower who put in only one variety—unless his choice turned out to be a happy one. Take-all and rust greatly affected the yields, and the best results were obtained from early-maturing varieties. These are almost invariably weak in the straw in more or less degree; and while false combs and choke cutters and other improvements in machinery admit of the crop being gathered even when lodged, weakness of straw is a serious defect in a wheat.

If the present year should turn out to be one of good rainfall and favourable to the spread of disease, the probability is that varieties will yield somewhat according to the table below. Should the season be dry, however, at any rate in the spring months and early summer, the old favourites above-mentioned will most likely yield best. Early-maturing varieties give a good account of themselves in almost any season, though one cannot get the highest returns possible from them every year. Sowing early-ripening wheats is therefore sound practice in the wheat belt, though one or two mid-season varieties may well be sown when starting to plant. M. A. Carleton, of the United States of America, in his book "The Small Grains," mentions the special needs in regard to wheat of each State where this cereal is largely grown, and early maturity is a desideratum in every case.

In addition to the varieties appearing in the accompanying table, a number of miscellaneous wheats were grown for identification, preserving seed, and for observation, besides a large number of rows of crossbreds undergoing fixation. Oats and barleys also occupied a portion of the field.

The plots under review were sown by hand, single grains dropped 5 to 6 inches apart in shallow furrows and covered in. The rows were 30 links long and 2 links apart. In every alternate row Hard Federation was sown as a buffer to make the conditions as uniform as possible for each variety under test.

Heavy rains in August caused much washing in the plots, the soil became saturated, and the weather continued dull and cool. In the spring, warm and cold weather alternated without the usual amount of sunshine. Warm, showery weather in November caused rust to appear, and towards the end of the month the earlier wheats were badly affected, though the extremely early sorts largely escaped attack. Continued rains caused the wheat to lean over considerably, but in spite of the rust many varieties matured a plump sample of grain.

From forty-five to fifty grains were sown in each plot, and the number of plants which finally grew to maturity was recorded. Before harvesting the plots six of the best selected plants were cut for breeding purposes, and the grain from each weighed; these are not inserted in the table, but are in some measure proportionate to the yields of the rows for the respective varieties. It would have been far more reliable to have ten plots of each wheat; but with the selected plant yields as a check, it is claimed that a fair idea may be formed of the relative productiveness of each wheat for the past season. In any case the yields should be taken as merely approximate, as so many factors over which we have no control occur to influence the returns.

Referring to the table, it may first be remarked that the wheats were not all sown at the same time, though the majority were planted between 2nd and 8th May. These were the main crop varieties; while those sown on 21st and 22nd May were the early varieties. Cowra No. 20 and Federal King, each resulting from the crossing of Federation with Yandilla King, were given a special trial of eight and nine rows respectively. "No. 83" was received too late to be included in the other tests, and was also given a special test, six rows of it being sown alternately with Hard Federation. The Departmental varieties recommended for the district are shown in heavier type. Some superior strains of Hard Federation were selected during the season, together with one or two variants which resisted rust better than the type; it is quite expected that they will reproduce this character. The yielding qualities of this variety may be taken as fairly represented by the strain received from Mr. Salter, who has been successful with this wheat the last three seasons at Wellington.

Some notes on other varieties may be of interest. "No. 83" is a cross between Federation and Huguenot, received from Mr. W. C. Grasby, of the West Australian Newspaper Co., Perth. This is the first year we have tried the wheat, but it has a good record in West Australia. The ear is white and the straw strong and fairly tall. We may here state that we have no seed available of these varieties now under review, but particulars as to their source are given for the benefit of those interested. Ecksteen, Primrose, Van Niekerk, Standerton Winter, and Bearded A were received from South Africa, where bearded wheats are in request, the birds being less attentive to varieties of this character. The straw of Ecksteen leans over rather badly, though it is the best of the series. Nyngan No. 3 and Clarendon have Gluyas Early in their pedigree; this wheat has a reputation in South Australia for resisting rust, and the crossbred Hudson's Early Purple Straw x Gluyas gave a good account of itself here. Hurst's No. 8 and No. 3 we believe to be crosses between Federation and barley. King's Early, King's Red, King's White, Basil, Golden Drop, Anvil, Triumph, Caliph, Farrer's Drought-resistant, Roseworthy, Queen Fan, Late Gluyas, Field Marshal, Wilmington, Brown Thew, Indian Blue, Leatherhead, and Odessa came from South Australia. Wagga No. 22 is the crossbred Red Provence x Jap. Cowra No. 20 and Federal King, as before stated, have the same parents; Cowra No. 20, however, resembles Yandilla King, and Federal

King takes after Federation. They are both Departmental crossbreds; but the latter, having done well with Mr. J. E. O'Grady, of Nemingha, was thus provisionally named by him. Newman's Early has done well for many years in the Wagga stud plots; it is a good hay variety. Chili was received from Mr. E. Jeffery, of Inverell; it is said to be frost-resistant, and certainly resists rust. Droophead has an ear which curves downwards, to some extent preventing bleaching of the grain; it is grown to a considerable extent in the Manilla district. Cowra No. 19 is a cross between Redskin and Yandilla.

The following wheats were received from Victoria:—Currawa, Minister, College Purple, Warden, "T. 4112," Moira, Penny, Avoca, Major, and Commonwealth. The best of the batch is Currawa, which is now a good deal grown in the Riverina. Coronation was obtained from an exhibit at the Royal Show in Sydney. Boureong, Currabubula Bearded, Baltinglas, and Empire were received from Mr. J. Sands, of Currabubula, who has sent us a number of selections from his field crops for testing. Boureong yields a very plump sample of grain; this wheat and Baltinglas appear to be sports from Federation. Walmer is a cross between Federation and Steinwedel received from Mr. Farrell, late of Parkes-road, Trundle. Budd's Early or Early Budd is a Queensland variety, as is also Free's Abundance. Prelude, Huron, and Marquis were received from Sir J. H. Carruthers. Pioneer came from the Orange district. "From Yandilla King" originated with a plant that turned out to be a natural crossbred. Cowra No. 15 has a complicated pedigree; it is a fine wheat to strip, and a cross has been made with this wheat and Federation. The straw in both wheats stands up well, and the grain of Cowra No. 15 is superior to that of Federation. Golden King was received from Mr. Inspector H. C. Stening. Australian Talavera, Hudson's Early Purple Straw, Dart's Imperial Jade, and Red Straw are old established varieties. Teakle's Red originated with a farmer in the Wagga district. Sanger's Prolific was selected by Mr. K. Sanger, of Coolamon. "No. 8" was sent to us by the Secretary of the Garra and Pinecliff branch of the Agricultural Bureau. Turvey originated in Rochester, Victoria. Robard's "A" and "B" came from Mr. Robards, of Trangie. Tarragon resembles Cleveland, and has done well in Queensland. Du Toits is an old variety, grown formerly by Dr. Cobb when identified with this Department. Schmidt's No. 1 is a selection from Federation made by a farmer of that name.

Space does not permit of mentioning all the samples grown which were received from farmers, but a wheat received from Mr. W. H. Heywood, of Manilla, seems to promise well, yielding bright plump grain. Florence yielded well; it was not included in the tests, not being recommended for this district. Sailor's Fortune, grown by Mr. Bunge, Sheep Hills, Victoria, yielded satisfactorily; it closely resembles Budd's Early. "No. 1" and "No. 2," from Mr. Plowman, of Goonumbla, yielded fairly well; but the Indian wheats received from Mr. Roach, La Bona, Gilgandra, proved unsuitable for our conditions.

TABLE showing Results of Wheat Variety Test Plots, Cowra, 1917–18.

Variety.	Date Sown.	Average of three Plots.				Remarks.
		No. days till ripe.	Gross Yield.	Net Yield Grain.	No. Plants harvested.	
	May.		lb. oz.	lb. oz.		
"No. 83" = (Huguenot x Federation).	28	190	5 1	1 8	45	Good straw.
Ecksteen	2–8	193	3 13½	1 7¼	33	Bearded.
Hurst's No. 8	21, 22	185	3 6¼	1 6½	38	Weak straw.
Nyngan No. 3	,,	186	3 12¼	1 5¾	40	Rather weak straw.
King's White	2–8	200	4 7	1 5¾	39	Bearded.
Clarendon (A)	21, 22	190	3 11¼	1 5½	38	Rather weak straw.
Canberra	,,	189	3 8½	1 5	39	Weak straw.
Basil	2–8	210	4 15½	1 4½	34	Straw medium.
King's Early...	,,	201	3 15	1 4½	35	Weak straw.
(Hudson's E.P. Straw x Gluyas) (A).	,,	210	3 14½	1 3¾	38	Straw medium.
Clarendon (B)	21, 22	186	3 4½	1 3½	36	Rather weak straw.
Wagga No. 22	,,	184	3 2¼	1 3½	39	Straw medium strong.
(Redskin x Yandilla x Federation) (A).	,,	188	3 2½	1 3½	43	Short straw.
(Standard Red x Yandilla)...	,,	191	2 15¼	1 2¾	43	Good straw.
Golden Drop	,,	189	3 8¼	1 2½	40	Tall straw.
Cowra No. 20	11	203	3 0	1 2½	...	Good straw.
Warren	2–8	212	3 2¼	1 2½	34	Fair straw (medium).
Primrose	,,	202	3 3½	1 2½	34	Resembles Comeback.
(From Purple Straw cross-bred) (A).	21, 22	192	3 3¼	1 2¼	41	Fairly hard to thresh.
Anvil	2–8	214	4 14¼	1 2	39	Coarse straw.
Triumph	,,	210	3 6¼	1 2	35	Very fair straw.
(M.N.W.B. x Jubilee) (A) ...	21, 22	188	2 11½	1 2	36	Rather weak straw.
King's Red	2–8	197	3 4	1 1¾	39	Bearded.
Van Niekerk	,,	204	3 11½	1 1½	33	,,
Hurst's No. 3	21, 22	182	2 14½	1 1¼	38	Weak straw.
Bomen	2–8	211	4 0	1 1	39	Good straw.
Caliph	,,	207	4 2½	1 1	38	Very fair straw.
Newman's Early	21, 22	191	3 8½	1 1	39	Tall straw, good.
Yandilla King	2–8	215	3 12½	1 0¾	38	Good straw.
Chili	,,	213	3 5½	1 0½	33	A hardy wheat.
Droophead	,,	214	3 4	1 0½	41	Very fair straw.
Hard Federation, Salter's (A)	,,	213	3 3½	1 0½	39	Rather good straw.
(M.N.W.B. x Jubilee) (B)	21, 22	190	2 15	1 0½	40	Weak straw.
Cowra No. 19 (A)	2–8	207	2 5¼	1 0	34	Rather weak straw.
Currawa	,,	212	3 8	1 0	38	A hardy wheat.
Farrer's Drought-resistant	,,	214	3 9½	0 15½	36	Very fair yielder.
(Hudson's E.P. Straw x Gluyas) (B).	,,	212	2 14	0 15½	34	Fairly strong straw.
Roseworthy	,,	215	3 9½	0 15½	39	Fairly good straw.
Hard Federation (B)... ...	2–8	213	3 4	0 15¼	38	
Coronation	,,	211	2 14	0 15¼	38	Like Comeback in growth.
(Redskin x Yandilla x Federation) (B).	21, 22	190	2 5½	0 15	37	Short straw.
Cowra No. 19 (B)	2–8	205	2 8	0 15	32	
Improved Steinwedel ...	,,	205	3 4¼	0 15	38	Rather rust-liable.
Standerton Winter	,,	219	3 14¼	0 15	37	Pinched grain.
Boureong	,,	210	3 0½	0 15	31	A good plump grain.
Currabubula Bearded ...	,,	214	3 9¼	0 15	33	Bearded straw, not very strong.
Walmer	,,	206	3 5¼	0 14¾	39	Holds its grain.
Bunyip	21, 22	177	2 6¼	0 14¾	37	Weak straw.

Results of Wheat Variety Test Plots, Cowra, 1917–18—*continued.*

Variety.	Date Sown.	Average of three Plots.				Remarks.
		No. days till ripe.	Gross Yield.	Net Yield Grain.	No. Plants harvested.	
	May.		lb. oz.	lb. oz.		
(Redskin x Yandilla x Federation) (c)	21, 22	192	2 14¼	0 14½	38	Short straw.
Hard Federation	2–8	213	2 15½	0 14½	33	Excellent grain-strain.
Minister	,,	209	2 15	0 14½	35	Very fair straw.
Budd's Early	,,	216	3 9½	0 14½	39	Also called Sailors' Fortune.
Prelude	21, 22	187	2 13	0 14	39	Bearded.
(Wallace x-bred)	,,	197	2 6½	0 14	38	Very fair straw.
Free's Abundance	2–8	198	2 10½	0 14	38	Bearded.
Queen Fan	,,	215	3 2¼	0 14	30	Holds its grain.
Pioneer	21, 22	187	2 4	0 13½	36	Rather pinched grain.
From Yandilla King ...	2–8	214	2 7	0 13½	33	Plants vary.
College Purple	,,	215	3 11	0 13¼	37	Liable to rust.
Late Gluyas	,,	205	2 10¼	0 13¼	33	Rather weak straw.
Warden	,,	218	4 6	0 13	40	Excellent for hay.
Rymer	,,	215	3 5	0 13	39	Medium strong straw.
Baltinglas	,,	212	3 6½	0 13	37	Resembles Federation.
"T 4112"	,,	218	3 4	0 13	35	Late maturing.
Federal King...	11	206	2 9	0 12¾	...	Rather good straw.
Field Marshal	2–8	216	3 6	0 12½	38	Very fair straw.
Cowra No. 15	,,	214	3 6	0 12½	41	Strips well.
Golden King	,,	199	3 11½	0 12¼	36	Rust-liable.
Zealand	,,	221	3 10	0 12	36	Very tall straw.
Cleveland	,,	221	3 4½	0 12	36	Rather late maturing.
Federation	,,	208	3 2½	0 12	40	Suffered from rust.
Wilmington	,,	210	2 3	0 12	32	Very straggling habit.
Australian Talavera ...	,,	215	3 5½	0 12	37	Medium yielder.
Marshall's No. 3	,,	214	2 12	0 11½	35	Good straw.
Moira	,,	216	3 11	0 11½	40	Rust-liable.
Hudson's Early Purple Straw	,,	213	3 2¼	0 11½	35	,,
Penny...	,,	214	3 3½	0 11½	40	,,
Comeback	,,	208	2 8½	0 11½	38	Medium yielder.
Huron	,,	220	2 10	0 11	34	Bearded ; late.
Brown Thew...	,,	205	2 9½	0 11	32	Rust-liable.
Teakle's Red...	,,	218	3 0	0 11	37	Good hay wheat.
(From Purple Straw, &c.) (B)	21, 22	193	2 15¼	0 10¾	40	Rust-liable.
From Droophead	2–8	216	2 9	0 10½	35	Not productive.
Sanger's Prolific	,,	214	2 15½	0 10½	35	Dart's Imperial type.
"No. 8"	,,	212	3 11¼	0 10½	38	Rust-liable.
Indian Blue	,,	213	2 14¾	0 10½	34	Resembles Budd's Early.
Turvey	,,	214	3 14	0 10¼	35	Rather weak straw.
Robard's B	,,	209	2 2¼	0 10	31	Rust-liable.
Jade	,,	213	2 10½	0 10	31	Rather weak straw.
Avoca	,,	210	3 12¼	0 9¾	36	Tall straw.
Dart's Imperial	,,	215	3 3	0 9½	39	Rust-liable.
Tarragon	,,	220	3 1	0 9½	34	Rather too late.
Marquis	,,	218	3 2	0 9½	38	Too late maturing.
Red Straw	,,	215	2 13	0 9¼	36	Rust-liable.
Leatherhead	,,	215	3 9¼	0 8¾	35	Holds its grain.
Major	,,	217	2 15	0 8½	36	Rust-liable ; late.
Du Toits	,,	208	2 3½	0 8½	31	Rust-liable.
Schmidt's No. 1	,,	211	1 13¼	0 8	36	Like Federation.
Robard's A	,,	215	2 2½	0 7¾	29	Rust-liable.
Bearded A	,,	214	3 8	0 7¼	39	Very pinched grain.
Commonwealth	,,	213	2 12¼	0 7	36	Rust-liable.
Empire	,,	214	2 4	0 6¼	31	,,
Odessa	,,	220	4 2½	0 5½	37	Late maturing.

Conclusions.

One feels chary of making any decided recommendations, considering the uncertainty of the season, but there are certain safe wheats for farmers in this district—Yandilla King and Currawa for early, and Clarendon and Canberra for late sowings, which may be mentioned, with Hard Federation, Warren, and Bomen for mid-season planting. In some seasons Warren goes down somewhat, though the straw is better than that of Canberra; Bomen, on the other hand, is subject to frosting if overtaken by a very cold snap when heading. Varieties which are distinctly promising are—"No. 83," Basil, Cowra No. 20 and Chili, and some others which will be further tested.

THE MOSQUITO DANGER.

UNDER this title a useful leaflet has been issued by the British Museum (Natural History) at South Kensington, London, and as it admirably summarises the position, it is reproduced here.

BREEDING PLACES.—Water, especially stagnant water, ponds, marshes, pools, puddles, water pockets, in hoof marks, empty tins, bottles, cisterns, water-butts, slowly running streams, &c.

TREATMENT OF BREEDING PLACES.—Drain or fill up all small pools and puddles; bury empty tins, bottles, &c. Crude mineral oil or kerosene sprayed on water kills the little wriggling mosquito larvæ.

HIDING PLACES OF MOSQUITOES.—Shady corners, darkened rooms or tents, hanging clothes, cupboards, under beds, tables, &c.

PREVENTION.—*Rooms and Tents.*—A teaspoonful of Keating's Powder, slowly burned in a moderate-sized room or tent, will generally drive out mosquitoes and sandflies. A teaspoonful of cresol, heated till it vaporises, has the same effect. A well-lighted window or door should be left for the insects to escape, and shut half an hour later. *Mosquito Curtains or Head Veils.*—These, or mosquito ointments, should be used at night by everyone who wishes to escape malaria. The edges of the curtain should be carefully tucked under the mattress so that there is no opening for the insects to enter. All holes should be mended at once. See that no mosquitoes have got in before going to sleep. *Wire and Gauze Screens.*—Wherever possible, recreation rooms, mess rooms, cook-houses, pantries, &c., should be fitted with gauze screens to both windows and doors.

ANTI-MOSQUITO AND SAND-FLY PREPARATIONS.—

1. *Eucarcit.*—A deterrent for flies, mosquitoes, and sand-flies. Eucalyptus oil, 2 oz.; liquid carbolic acid, 4 drops; citronella oil, 2 oz. Mix intimately, and put in a bottle with a sprinkler screw-top. *Shake before use.* A few drops should be used on the hands, face, and neck before going to bed. The ingredients should be stated when ordering.
2. *Preparation recommended by Professor Howlett.*—Oil of cassia, 1 oz.; brown oil of camphor, 2 oz.; vaseline, lanoline, or salad oil, 3 oz.; mix well, and smear on the skin in small quantities before nightfall.
3. Oil of peppermint, 1 oz.; vaseline, spirit or Pond's extract, 2 oz.; oil of cassia, 1 oz.

Caution.—Scratching the bites of mosquitoes and sand-flies may lead to sores. Don't scratch, but put on a grease or lotion instead.

R.A.S. Field Wheat Competition.

[The Royal Agricultural Society for the second time promoted a Field Wheat Competition, and with the approval of the Minister of Agriculture, Mr. H. C. Stening, Inspector of Agriculture, acted as judge. The following extracts from the report furnished to the President and Council of the Society by Mr. Stening will be found of interest to all wheat-growers.—Ed.]

There were seventy-five entries, of which twenty-two were withdrawn prior to the time of judging, and there was a further withdrawal of twenty entries at the eleventh hour, when a visit had been made to the farms. Only thirty-three entries remained, therefore, that were actually judged. The abnormal weather conditions during the month of November were responsible in large measure for this large withdrawal of entries. Crops which at the time of entry bore great promise of success in the competition, had deteriorated considerably from a show point of view, in consequence either of damage by hail, rain and wind storms, the ravages of fungus diseases, or excessive weed growth.

Judging was commenced at Wagga on 4th December, and a nearby direct route was taken for the early districts, where the crops were ripening; and as the weather was for the most part favourable, the judging proceeded without delay, and was completed in 9½ days, the car arriving back in Wagga on 13th December, after covering a total distance of about 1,100 miles.

After careful inspection of the crops, points were allotted according to the scale adopted by the Murrumbidgee Pastoral and Agricultural Association in their Crop Competitions, with the result that the awards are made as follows:—

D. and J. Gagie, West Wyalong, 146½ points, first.
A. Wilson, Old Junee, 142 points, second.
E. Field, Marrar, 140 points, third.
B. J. Stocks, Cunningham, 139½ points, highly commended.
R. E. Trengove, Koorawatha, 137 points, highly commended.

The Winning Crops.

Messrs. Gagie Bros. have succeeded in winning first prize with a well-grown crop of Federation, estimated to yield 33 bushels per acre, and which was very even and "standing-up" perfectly. There was a little rust present, but the crop had escaped damage, for the sample of grain, which was ripe at the time of judging, was most satisfactory. Otherwise the crop was free from disease and was as perfect as can be expected as regards purity and freedom from weed-growth, denoting not only good cultivation but also extreme care in the choice of seed.

The second prize goes to a very even, well-headed crop of Yandilla King grown by Mr. A. Wilson on very old land that had been fallowed and wel cultivated.

Mr. E. Field secures third prize with a pure, even crop of Federation, also grown on well-fallowed land.

The crop exhibited by Mr. J. B. Stocks scores only half a point less than that of Mr. Field. It is particularly well-headed, estimated to return the highest yield in the competition, even though the yield was somewhat depreciated owing to a portion of the crop being on low-lying land, and also as the result of a slight attack of take-all. A portion of the crop was Federation and a portion Yandilla King, grown on well-cultivated land, which was carrying its third crop, and therefore had to concede a handicap to crops sown on older land.

It is rather remarkable to find Federation carrying off the first and third prizes in a year when rust is so prevalent, inasmuch as this variety is very rust-liable ; but from an examination of the grain of ripened crops of this variety, it is evident that not nearly the same extent of damage will be caused by rust as was the case last season. Federation forms 60 per cent. of the crops judged, and apparently the disastrous experience with this variety under the abnormal conditions prevailing last year has not robbed it of its popularity, for in normal seasons it has proved to be the most consistent as a bag-filler, and the most reliable for the sowing of large areas.

Yandilla King, which was the variety to secure second prize, is a worthy rival of Federation as a grain yielder, and has the additional advantage that it also produces large yields of good quality hay. The crops of this variety were "standing up" most satisfactorily in comparison with other tall-growing varieties, and was not badly affected with rust.

A few remarks under the various headings for which points are allotted may be of interest.

Apparent Yield.

While very satisfactory yields are promised by most of the crops inspected, yet no exceptionally high yields are anticipated. The rainfall during the growing period has been greatly in excess of requirements for the production of extraordinary results in the way of yields. The abnormal weather conditions in November have also been responsible for depreciating yields to a large extent. Heavy rains and high winds have caused some crops to tangle up and lodge in patches. In such cases the points allotted were according to the grain that it was estimated could be recovered by the latest appliances for harvesting "down crops." Fungus diseases are also the cause of a reduction of yields ; the rust epidemic is calculated in some instances to cause the grain to be slightly "pinched," and take-all also has taken its toll of some crops.

Trueness to Type.

Those crops scoring 18 points or over may be considered most satisfactory as regards purity ; these form less than half of the crops inspected. In some instances the crops were very badly "mixed," due either to the sowing of impure seed or to self-sown seed of the variety previously grown on the land. The former may be remedied by sowing small areas for seed purposes with pure seed on clean land, and exercising care when harvesting and sowing to prevent admixture with grain of other varieties. In order to clean the land from "strangers," the cultivation of the stubble land shortly after harvest is recommended to encourage the early germination of self-sown grain.

Disease.

The season has been very favourable for the development of fungus diseases, red-rust, take-all, and bunt being prevalent, while flag-smut and loose smut are also present to a smaller extent. Under this heading, there has been less points deducted in the case of the appearance of a disease in the crop such as rust, which is to a great extent beyond the control of the farmer, than when the crop is infected with bunt, a disease against which the farmer has an excellent weapon of defence.

The rains and muggy weather in spring following on the abundant winter rainfall supplied very favourable conditions for the development of red rust, which at the time of judging was present on stem and ear. The crops, however, were very far advanced towards maturity, and some were even ripe, and it was observed that little or no damage had been caused to the crops. Few of the severely-attacked crops will produce slightly pinched grain.

Take-all has attacked some crops at a late stage of growth since the crops have headed, resulting either in "dummy" heads or "white" heads containing shrivelled grain, according to the stage at which the disease asserted itself. There are some farmers who appear to doubt that this affection is take-all, but in every case examined the characteristics of the disease were present. Frequently it is an isolated plant here and there in the crop that is affected; these will probably be the centres of infection for next year's crop, and it will be wise to treat badly-infested paddocks to a spell from wheat for at least two seasons by growing oats one year and fallowing another year, the fallow to be kept clean from growth, as take-all will thrive on other plants besides wheat, notably barley grass. By adopting this practice the fungus may be starved.

Bunt (otherwise known as Stinking Smut or Ball Smut) was detected in seven of the crops judged, three of which were badly affected. In one case the seed was sown on a dry seed-bed without pickling, while in the others the seed was said to have been pickled, but the method of treatment must have been faulty. A solution made by dissolving bluestone in water, at the rate of 1½ lb. of bluestone to 10 gallons of water, if properly applied, is an effective preventive for bunt, provided there are no unbroken bunt balls among the grain, for the solution does not penetrate the bunt balls during the short time of immersion and these are liable to be broken after pickling, and the free spores scattered among the grain, which is thus reinfected.

It is a common practice for farmers to use ½ lb. bluestone to a bag of wheat, but it would be much surer to reckon the amount of bluestone according to the quantity of water, and thus keep the solution of a constant strength.

DETAILS OF AWARDS.

Name and Address of Competitor.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during growing period.	Apparent Yield.	Trueness to Type.	Freedom from Disease.	Evenness.	Cleanliness.	Methods of Cultivation.	Total Points.
				lb.	lb.		inches	*	†	‡	§	‖	¶	
1. D. and J. Gagie, "Spy Hill," West Wyalong.	Federation	Fallowed August, disced March	Last week April	50	35	6th	15·15	33	19½	19	19	29	27	146½
2. A. Wilson, "Lisgo," Old Junee.	Yandilla King	Fallowed August, harrowed spring, spring-toothed January, disced before sowing.	End of April ..	60	56	Very old land.	..	29	18	18	19	28	30	142
3. E. Field, "Wave Hill," Marrar.	Federation	Fallowed July, disced spring, spring-toothed and harrowed prior sowing.	May	50	45	8th	..	26	19	18	19	28	30	140
4. B. J. Stocks, "Linden Hills," Cunningham.	Federation and Yandilla King.	Fallowed July-August, spring-toothed and harrowed October, skim-ploughed prior sowing.	Mid-April ..	60	45	3rd	..	35	18½	17	18	25	26	139½
5. R. E. Trengove, "Green Bank," Koorawatha.	Dart's Imperial	Fallowed August, harrowed spring, spring-toothed prior sowing.	1st week April	41	35	6th	20·79	29	18	18	17	27	28	137
6. F. Adams, Iandra Estate, Greenethorpe.	Marquis	Fallowed August, disced February, spring-toothed prior sowing, crop fed-off.	End of March	40	35	Old land ..	24·80	28	17	15	18	28	29	135
7. W. R. McEntyre, "Wilgoma," Eurongilly.	Yandilla King	Fallowed August, disced April	1st week May ..	50	45	6th	..	33	19	13	19	26	25	135
8. R. Thompson, Forbes-road, Cowra.	Federation	Fallowed October-November, disced February, skim-ploughed prior sowing.	3rd week April	50	40	Very old land.	..	25	18	18	17	28	28	134
9. C. Hicks, "Roma," Bethungra.	,, ...	Fallowed July-August, harrowed September, spring-toothed February and before sowing, harrowed after drill, portion crop harrowed.	1st week May ..	45	45	New land ..	24·03	33	16	18	18	24	24	133
10. W. Pengilly, "Greenshade," Belubula.	,, ...	Fallowed June-July, disced spring, spring-toothed prior sowing.	Early in June ..	32	Nil.	4th	18·60	29	17	18	18	25	26	133
11. A. Reid, "Hiawatha," West Wyalong.	,, ...	Fallowed July, skim-ploughed prior sowing.	Last week May	42	30	4th	11·87	32	17	18	17	24	25	133

Maximum Number of Points } * 1 point for every 1 bushel apparent yield.

† 20

‡ 20

§ 20

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1st crop ..	24
2nd ,, ..	25
3rd ,, ..	26
4th ,, ..	27
5th ,, ..	28
6th ,, ..	29
Over 6 crops ..	30

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1st crop ..	24
2nd ,, ..	25
3rd ,, ..	26
4th ,, ..	27
5th ,, ..	28
6th ,, ..	29
Over 6 crops ..	30

Details of Awards—*continued.*

Name and Address of Competitor.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during growing period.	Apparent Yield.	Trueness to Type.	Freedom from Disease.	Evenness.	Cleanliness.	Methods of Cultivation.	Total Points.
				lb.	lb.		inches	*	†	‡	§	‖	¶	
12. R. H. Thackeray, "Wootoona," Young.	Yandilla King, Moira, and Marshall's No. 3.	Fallowed August-September, harrowed spring, disced prior sowing.	2nd week May	45	50	4th	23·95	28	19	17	17	25	26	133
13. G. A. Donaldson, "Pine Vale," Combaning.	Federation	Fallowed August-September, harrowed spring, disced autumn.	End of April ..	45	30	4th	...	28	19	18	15	26	26	132
14. D. Murphy, "Long View," Sebastopol.	Yandilla King and Turvey.	Scarified March-April, 1916, fallowed June-July, harrowed twice spring, scarified twice February-March and prior sowing.	End May ..	58	56	8th	24·71	27	18	16	12	29	30	132
15. Mrs. H. Pratt, "Ellerslie," Harefield.	Droop-head Federation	Fallowed August, disced before sowing..	1st week May..	45	45	Very old land.	..	28	15	16	18	27	28	132
16. G. Stanyer, "Wood Park," Illabo.	Federation	Fallowed September, spring-toothed October-November, disced April.	Mid-April ..	60	45	,,	..	25	17	18	18	25	29	132
17. S. L. Myles, "Rosebrook," Canowindra.	,, ...	Fallowed August, disced February ..	Mid-May ..	40	30	Over 6 ..	..	26	16	17	18	26	28	131
18. S. R. Garvin, Ariah Park.	,, ...	Fallowed June to September, skim-ploughed March, harrowed.	End April ...	30	33	,, ..	..	24	17	17	17	27	27	129
19. H. A. Traves and Bros., "Rosewood," Canowindra.	Marshall's No. 3 ..	Fallowed September-October, harrowed spring, disced before sowing.	2nd week May	50	27	,, ..	..	25	17	16	17	26	28	129
20. F. Kirby, "Leithcourt," Bolygamy.	Purple Straw	Fallowed August, disced April.	3rd week April	45	45	New land..	..	27	17	18	19	24	22	127
21. A. McCrone, Combaning.	Federation	Fallowed September, harrowed spring, disced autumn.	Last week April	45	20	,, ..	..	29	19	18	15	23	23	127
22. A. V. Williams, "Glensloy," Young.	,, ...	Fallowed	Early May ..	60	45	,, ..	28·00	28	16	17	18	22	23	124

Maximum Number of Points	*	†	‡	§	‖	¶
	1 point for every 1 bushel apparent yield.	20	20	20	1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops .. 30	1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops .. 30

DETAILS OF AWARDS—*continued.*

Name and Address of Competitor.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during growing period.	Apparent Yield.	Trueness to Type.	Freedom from Disease.	Evenness.	Cleanliness.	Methods of Cultivation.	Total Points.
				lb.	lb.		inches	*	†	‡	§	‖	¶	
22. J. Boardman, "Westville," Canowindra.	Hard Federation	Fallowed end August, harrowed twice spring, disced February.	End May	53	Nil.	New land	19·10	25	19	18	16	22	23	123
24. A. Fairweather, "Woodlands," Marrar.	Federation	Fallowed August, harrowed and spring-toothed spring, spring-toothed and harrowed before sowing.	May	50	60	Very old land.	..	21	17	16	18	21	30	123
25. A. Hart, "Boorargogie," Wyalong.	Currawa, Canberra, and Federation.	Fallowed July-August, spring-toothed before sowing.	Last week June	60	40	New land	..	25	19	18	17	23	21	123
26. Mrs. C. A. Lamont, "Kooringal," Harefield.	College Purple	Fallowed August, spring-toothed October, disced March, half re-disced before sowing.	Mid-June	50	50	Over 6	..	22	16	15	18	25	27	123
27. J. Shea, "Fairview," Galong.	Federation and Rymer	Fallowed August, spring-toothed before sowing.	Mid-May	60	20	New land	..	24	17	16	17	22	22	118
28. W. Cobley, Canowindra.	Federation	Stubble land, ploughed and harrowed May.	End May	30	Nil.	6th	..	23	15	16	17	24	22	117
29. Cusack Bros., "Rockdale," Canowindra.	”	Stubble land, ploughed April	End April	30	Nil.	2nd	..	25	17	16	18	20	17	113
30. P. Press, "Eureka," Condobolin.	Gluyas Early	Stubble land, ploughed May	Last week May	45	40	2nd	..	20	16	13	18	24	19	110
31. C. R. Sutherland, "Claremont," Bendick Murrell.	Federation and Yandilla King.	Stubble land, ploughed April	End April	45	30	4th	..	21	16	10	17	24	20	108
32. O. E. Barnes, "Barrenong," Forbes.	Florence	Stubble land, ploughed March	End June	45	Nil.	4th	..	15	10	18	15	24	20	102
33. J. Williams, "Barrenong," Forbes.	”	” ” ”	Early July	45	Nil.	4th	..	14	10	18	15	24	20	101

Maximum Number of Points } * 1 point for every 1 bushel apparent yield.

† 20

‡ 20

§ 20

‖		¶	
1st crop	24	1st crop	24
2nd ”	25	2nd ”	25
3rd ”	26	3rd ”	26
4th ”	27	4th ”	27
5th ”	28	5th ”	28
6th ”	29	6th ”	29
Over 6 crops	30	Over 6 crops	30

Evenness.

The principal cause for reduction of points under this heading was the lodging of crops as the result of heavy rain and wind storms. The lodgment of water in depressions was also a cause of unevenness, the crop grown in such depressions being stunted.

Cleanliness.

Evidently the season has been most favourable for the prolific growth of weeds, particularly black oats, thistles, and prickly lettuce. Only three crops were awarded maximum points for cleanliness, and two of these were grown on land that had not previously cropped. The other was the prize-winning crop of Messrs. Gagie Bros., which was the sixth crop grown on the land.

Messrs. Gagie Bros. keep weed-growth in check by the judicious use of sheep on the fallows. No doubt the shortage of stock is in some measure responsible for the very dirty crops this season, for it was common in the early summer last year, and also this year, to see fallows carrying a growth of weeds in full seed; when the seed falls on the well-prepared seed-bed it cannot fail to give rise to an abundant growth of weeds to compete with the subsequent wheat crop for possession of the land.

Methods of Cultivation.

In favourable seasons crops that have been "roughed in" may yield well, but by allotting points for methods of cultivation it precludes the possibility of what is termed a "fluke crop" from winning the competition against a crop on well-farmed land.

All but six of the crops judged were grown on fallowed land, and it is remarkable to find that three of the crops on unfallowed land were located in the drier districts, where fallowing is so essential to success; and, in fact, the cultivation methods as a whole in these districts are of a much lower standard than in the more favoured districts. Too frequently the fallows had not been cultivated until seeding time, and thus no effort was made to conserve in the soil the moisture which had been stored up in the winter months. The cultivation of the fallows in the early spring is of the greatest importance, for it is at this period of the year that there is the greatest evaporation of moisture from the soil.

HERB-GROWING IN NEW SOUTH WALES.

Now that increasing difficulty is being experienced by merchants in purchasing the necessary quantities of culinary herbs, attention is being directed to the growing of these plants in our own State.

Intending buyers may gather some idea of the prospects of the industry from the following statement by one of the leading houses:—"So long as the quality approaches that of the imported herbs, we will be prepared to pay the same rate as the imported herbs cost us. For your guidance, we might mention the rates a recent shipment cost. We generally buy a ton or two at a time. Sage, 1s. lb.; mint, 1s. 8d. lb.; marjoram, 1s. lb.; thyme, 9½d. lb. There are also other regular buyers who can take fair quantities."

SEED WHEAT FOR SALE AT THE GOVERNMENT FARMS.

THE Department of Agriculture has a limited quantity of Pure Seed Wheat for sale for the coming season. The price of the Seed is 6s per bushel, plus 9d. for each bag supplied, f.o.r. nearest railway station to the Farm supplying.

Applications should be made direct to the Manager of the respective Farms.

Variety.	Farm where seed is available.	Variety.	Farm where seed is available.
Hard Federation	Wagga Experiment Farm, Bomen.	Federation	Cowra Experiment Farm.
Marshall's No. 3		Hard Federation	
Canberra		Yandilla King	
Bomen		Marshall's No. 3	
Yandilla King		Zealand	
Comeback		Rymer	
Bunyip		Commonwealth	
Zealand		Warren	
		Canberra	
Cleveland	Bathurst Experiment Farm.	Currawa	
Yandilla King		Bomen	
Marshall's No. 3			
Hard Federation		Warren	Glen Innes Experiment Farm.
Federation		Genoa	
Comeback		Canberra	
		Thew	
Federation	Temora Demonstration Farm.	Florence	
Hard Federation			
Florence		Steinwedel	Coonamble Experiment Farm.
Firbank		King's Early	
Canberra		Warren	
Comback		Canberra	
Bunyip		Walmer	
Bomen		Florence	
Sunset			
		Florence	Condobolin Demonstration Farm.
Steinwedel	Nyngan Demonstration Farm.	Canberra	
Firbank		Hard Federation	
Florence		Sunset	
Sunset			

BERKSHIRE BOARS FOR SALE.

THE following Berkshire boars are for sale at the Women's Training Farm, Cowra:—

1 Boar, at 6 months.
2 Boars, at 5 ,,
4 ,, ,, 4 ,,
10 ,, ,, 8 weeks.

The price fixed is £2 2s. each at 8 weeks old, and 2s. 6d. per head per week additional as they grow older, f.o.r. Cowra. £1 is charged for a crate for one large pig or two small ones, which amount is refunded on return of crate. All inquiries should be addressed to

The MANAGER,
Women's Training Farm,
Cowra.

List of Fertilisers in New South Wales.

A. A. RAMSAY AND R. M. PETRIE.

1918 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, is the result of the revision of the list issued in March, 1917.

The list is published in the interest of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Fertilisers Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

On account of the war, potash manures are unprocurable, and the market value of other manures may alter. An attempt has, however, been made to assign a "unit value" to the other fertilising ingredients, viz., nitrogen and phosphoric acid, as has been done in pre-war years.

A word is necessary in explanation of the column giving the "manurial value" of the manures. These figures are calculated from the composition of the manures as represented by analysis, a definite unit value being assigned to each of the fertilising ingredients (except potash). The units on which are computed the values given here are as follows :—

UNIT-VALUES of fertilising ingredients in different manures for 1918.

	Per unit. s.	d.
Nitrogen in nitrates	29	4
,, in ammonium salts	20	1
,, in blood, bones, offal, &c.—fine	21	10
Phosphoric acid in bones, offal, &c.—fine	4	5
Phosphoric acid (water soluble) in superphosphates	6	1

PRICE per lb. of fertilising ingredients in different manures for 1918.

	Pence per lb.
Nitrogen in nitrates	15·7
,, in ammonium salts	10·8
,, in blood, bones, offal, &c.—fine	11·7
Phosphoric acid in bones, offal, &c.—fine	2·4
Phosphoric acid (water soluble) in superphosphates... ...	3·3

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, a bone-dust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid :—

4 × 21s. 10d. = £4 7s. 4d. = value of the nitrogen per ton.
20 × 4s. 5d. = £4 8s. 4d. = ,, phosphoric acid per ton.

£8 15s. 8d. = value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail price of the manure, and the fact that in the majority of cases the price asked and the value assigned are fairly close shows that the valuation is a reasonable one.

These figures have been checked in all cases by analyses made on samples collected by an officer of the Department. It by no means follows, however, that the particular product analysed and here published will be in stock for any length of time.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid." In these cases the lower one has been published in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession; for example, if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed up.

In the case of bone-dust, blood and bone manures, &c., the valuation has been made irrespective of the fineness of division, and is based on the amounts of fertilising ingredients only; but it must be borne in mind that finely ground bone-dust acts more rapidly than coarse, and that unground fragments of bone only become available as fertilisers very slowly.

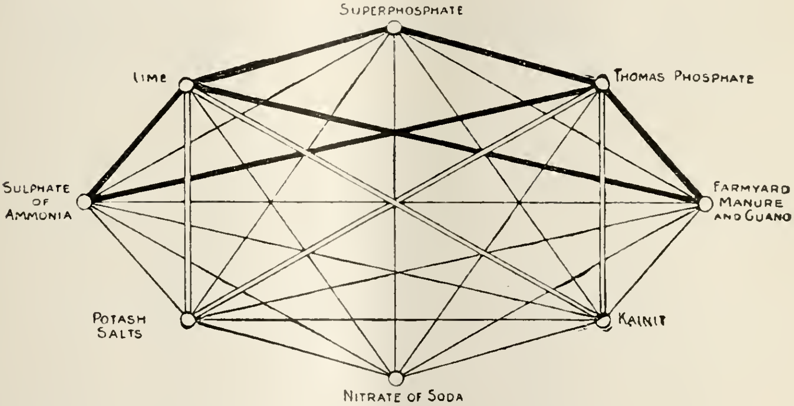
A word may be added in explanation of the term "water-soluble phosphoric acid." When bones or mineral phosphates are acted on by sulphuric acid, a portion of the tricalcic phosphate is converted into another lime compound, known as monocalcic phosphate or superphosphate. This compound is soluble in water, and it is to its presence that the rapid action of the phosphate is due. This is the "water-soluble" acid of the table. In many superphosphates, however, a considerable portion of this compound has undergone change. This change may be due to the salts of iron and alumina present, or to the length of time it has been kept, and it results in the formation of a third lime compound—bicalcic phosphate. This is known as "reverted" or "retrograde" phosphoric acid, and is insoluble in water, but soluble in ammonium citrate.

In the fourth table are a number of waste products which may in many cases be economically utilised.

When purchasing a manure, always insist on a guarantee of its composition as determined by the analysis.

Never add lime to a manure containing sulphate of ammonia or blood and bone manures, as in these cases loss of nitrogen results; and when lime has been applied to the land, do not use such manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures.



Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single thin line may be mixed together at any time.

TABLE I.—SIMPLE FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.					Manurial Value.
		Nitrogen.	Equal to Ammonia.	Lime.	Potash.	Phosphoric Acid.	
		per cent.	per cent.	per cent.	per cent.	per cent.	£ s. d.
Sulphate of ammonia ..	Geo. Shirley, Ltd., 7 Bent-st. ..	20·0	24·29	....	..	..	20 1 8
Gypsum	Farmers' Fertilisers Corporation, Ltd., 31 Hunter-st.	....	..	96% Cryst. $CaSO_4$	..	..	....
Sulphate of ammonia ..	" " ..	20·4	24·77	....	..	..	20 9 8
Nitrate of soda ..	" " ..	15·9	19·31	....	..	..	23 6 5
"Triphosfate" ..	N.S.W. Phosphate Co., Ltd., 18 Hunter-st.	..	..	....	..	11·45	....
Sulphate of ammonia ..	Eaton, Burns, & Co., 75 York-st. ..	20·4	24·77	....	..	..	20 9 8
Nitrate of soda ..	" " .	15·5	18·82	....	..	..	22 14 8
Sulphate of ammonia ..	Australian Gas Light Co., Kent-st.	20·42	24·82	....	..	..	20 10 1

II.—Bone and Blood Manures.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.		
		Nitrogen.	Equal to Ammonia.	Phosphoric Acid.	Equal to Tricalcic Phosphate.			
		per cent.	per cent.	per cent.	per cent.	£	s.	d.
Bone-dust	Geo. Shirley, Ltd., 7 Bent-st.	3·7	4·5	21·0	45·85	8	13	7
Blood and bone	,, ,,	5·0	6·07	17·0	37·11	9	4	3
Blood and bone	R. S. Lamb & Co., 32 Jamieson-st.	5·35	6·5	14·66	32·0	9	1	7
No. 1—General purpose bone-dust	Wooster Fertilisers, Ltd., O'Riordan-street, Alexandria.	3·7	4·5	21·98	48·0	8	17	10
No. 2—Pure steamed bone-dust	,, ,, ,,	3·91	4·75	24·50	53·50	9	13	7
No. 3—Bone and blood manure	,, ,, ,,	4·94	6·00	13·74	30·00	8	8	7
No. 5—Raw or green bone-dust	,, ,, ,,	4·01	4·86	24·41	53·3	9	15	4
Bone and blood manure	Kitchen and Sons, Ltd., 365 Kent-st.	5·5	6·68	17·0	37·11	9	15	2
Special bone and blood manure	,, ,, ,,	6·0	7·29	13·0	28·38	9	8	5
Excelsior bone-dust	M. Gearin, Old Botany road, Mascot	3·7	4·5	21·98	48·0	8	17	10
Bone-dust	M. O'Riordan and Sons, O'Riordan-street, Alexandria.	3·29	4·0	21·98	48·0	8	8	11
Pure fertiliser	N.S.W. State Abattoirs, Homebush Bay	6·68	8·11	12·87	28·10	10	2	8
Sandown fertiliser	J. Cooke & Co., Propy., Ltd., Sandown Works, Parramatta.	6·85	8·32	10·44	22·82	9	15	8
Bone and blood, No. 1	Farmers' Fertilisers Corp., Ltd., 31 Hunter-st.	6·25	7·59	14·50	31·65	10	0	6
,, ,, No. 2	,, ,, ,,	6·25	7·59	16·00	34·93	10	7	2
Blood	B. Richards and Sons, Ltd., Riverstone	13·70	16·60	......	......	14	19	1
Bone-dust	,, ,, ,,	3·17	3·85	26·78	58·51	9	7	6
Bone-dust, B.D. 1	Paton, Burns, & Co., 75 York-st.	3·7	4·5	22·12	48·29	8	8	6
,, B.D. 2	,, ,, ,,	3·7	4·5	22·12	48·29	8	8	6
,, B.D. 3	,, ,, ,,	3·3	4·0	20·70	45·19	8	3	6
,, B.D. 4	,, ,, ,,	3·3	4·0	18·4	40·17	7	13	4
Bone and blood, B.B. 1	,, ,, ,,	6·5	7·89	12·0	26·20	9	14	11
,, ,, B.B. 2	,, ,, ,,	5·5	6·68	17·0	37·11	9	15	2
Bone phosphate	,, ,, ,,	......	......	29·77	64·99	....		
Dried blood	,, ,, ,,	13·0	15·79	......	......	14	3	10

III.—SUPERPHOSPHATES, MIXED FERTILISERS, AND IMPORTED FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.
		Nitrogen.	Water-soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	
		per cent.	per cent.	per cent.	per cent.	£ s. d.
Superphosphate	Geo. Shirley, Ltd., 7 Bent-st.	......	17·0	......	......	5 3 5
Basic superphosphate	,, ,, ...	......	0·7	19·7	......	......
Manure No. 8	,, ,, ...	4·0	13·0	......	......	7 19 5
,, No. 10	,, ,, ...	2·0	13·0	......	......	5 19 3
No. 0 Phosphatic manure	Wooster Fertilisers, Ltd., O'Riordan-street, Alexandria	2·87	8·5	19·1	......	7 18 9
No. 1 Superphosphate	Farmers' Fertilisers Corp., Ltd., 31 Hunter-st. ...	......	17·0	......	......	5 3 5
Sulphide superphosphate	Gibbs, Bright, & Co., Ltd., 37 Pitt-st.	......	17·0	......	......	5 3 5
Nitro superphosphate	,, ,, ...	1·6	15·0	......	......	6 4 5
No. 1 Bone and superphosphate ...	,, ,, ...	1·5	8·5	19·0	......	6 10 10
No. 2 ,, ,, ...	,, ,, ...	0·8	13·0	19·0	......	6 3 1
Potato manure	,, ,, ...	1·25	14·5	16·0	3·5	......
Orchard manure	,, ,, ...	2·3	13·0	14·5	4·5	......
Maize and fodder crop manure ...	,, ,, ...	3·0	11·0	14·0	1·0	......
Root crop manure	,, ,, ...	3·25	7·5	10·0	3·0	......
Leguminous manure	,, ,, ...	......	15·5	18·0	2·4	......
Special orchard manure	,, ,, ...	2·3	12·0	12·8	7·25	......
Superphosphate	Paton, Burns, & Co., 75 York-st.	......	17·0	......	......	5 3 5

IV.—Waste-Products, Ashes, &c., not on the Market.

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Deposit from wool-scouring tanks. 1	Liverpool Wool-scouring Works	....	....	·64	·78	....	....	....	·72
,, 2	,, ,, ,,	....	....	1·02	1·24	....	....	·16	·39
,, 3	,, ,, ,,	....	....	1·37	1·66	....	....	·14	·2
Deposit from breakers	,, ,, ,,	34·47		1·81	2·20	50·68	·85	·88	1·60
Sediment from wool-scouring works.	Yass	19·57		·59	·71	8·24	·97	......	·20
Scutch	Australian Glue-Gelatin Works, Alexandria.	56·98	....	2·95	3·58	....	4·56	None.	None.
,, from limed pelts	Hugh Wright, Auburn	5·32	72·42	1·80	2·18	3·61	9·36	·81	·20
Decomposed hair and lime	Fellmongery	9·70	57·08	6·86	8·83	1·22	26·27	....	....
Tan-yard refuse	Tanneries, St. Mary's	6·43	33·83	2·24	2·72	21·43	26·96	·67	....
Tan refuse	....	7·10	50·90	2·62	3·18	16·03	18·58	·56	·18
Fleshings from tannery	....	·91	75·37	44·43	5·38	5·98	....	1·14	·04
Salt (sweepings from tannery)	....	3·04	....	·70	·85	·38	....	....	....
Wool-waste	....	....	....	8·15	9·89	....	....	....	....
,,	....	34·33	28·20	1·97	2·39	26·03	2·75	·37	·32
Peat	H. Tager, Moss Vale	72·93	16·68	·35	·42	10·39 (ash).	....	....	....
,,	S. Cook, Pyrmont	49·51	34·63	·75	·91	....	....	·06	·01
Burnt peat	....	....	....	....	....	84·45	....	·25	·33
Filter-press muck	Cane-mills, Broadwater	16·39	26·07	·22	·27	34·86	13·20	5·98	·44
Megass	Clarence River cane	22·86	67·32	·63	·78	8·61	·30	·01	·05
Megass ash	,, ,,	....	....	....	....	87·69	3·07	·16	·51
,,	Richmond River cane	....	....	....	....	....	1·11	·21	4·79
Bloodwood ash	....	....	....	....	....	....	8·47	·27	5·25
Ironbark ash	....	....	....	....	....	....	....	·82	1·53
Blackbutt ash	....	....	....	....	....	....	7·27	·04	2·02
Red-gum ash	....	....	....	....	....	....	....	·38	4·17
Spotted-gum ash	....	....	....	....	....	....	....	·10	·70
Boxwood ash	....	....	....	....	....	....	....	·67	1·65
Grass-tree ash	....	·86	1·78	....	....	33·48	24·94	3·07	5·30
Vine-cuttings ash	....	·49	....	....	....	60·64	11·34	1·85	3·76
Red-apple ash	....	....	....	....	....	54·52	13·96	·47	6·00
She-oak ash	....	....	....	....	....	8·57	42·35	8·85	2·19
Hardwood ash	....	·50	1·35	....	....	62·38	13·50	1·76	3·09
Ash of wild melon	Stock Branch	....	....	....	....	....	5·12	4·85	27·08
Wood ashes	....	·30	....	....	....	21·43	41·37	·35	2·80
,,	Wentworth Irrigation Area	....	....	....	....	11·12	50·78	·58	3·21
Ash of kerosene shale	Hartley Vale	1·49	27·93	·70	·85	67·59	....	·28	·14
Eucalyptus leaves ash	....	....	....	....	....	....	....	....	10·54
,, ,,	....	....	....	....	....	....	....	....	20·50
Camphor laurel ash	....	....	....	....	....	....	....	....	2·55
Coachwood and sassafras wood ash.	....	....	....	....	....	....	16·16	3·60	13·53

IV.—WASTE-PRODUCTS, ASHES, &C., NOT ON THE MARKET—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Coals (ash)	....	....	....	....	....	....	·61	·29	·16
Clinker from locomotive boiler ..	....	....	....	....	....	....	....	....	·25
Residue from furnace	R. E. Bragg, Marrickville	1·55	35·63	·54	·61	52·40	·64	·43	·09
Sea-weed ash	....	....	....	....	....	....	9·27	·49	·59
,, ...	....	....	....	....	....	....	6·29	1·27	17·55
,, ...	....	·43	....	....	....	56·28	9·39	·47	2·26
,, ...	Manly	....	....	....	....	43·06	6·52	·91	13·98
,, ...	,, ...	....	....	....	....	·07	·53	·19	34·30
,, ...	Mr. Harvey, Department	3·25	19·46	....	....	61·63	4·22	·33	·22
,, ...	....	....	....	....	....	....	4·63	1·00	31·41
Sea-weed, fresh state .. .	....	80·00	....	·16	·19	....	·41	·09	1·18
Sea-weed	....	41·03	42·49	·14	·17	....	....	·21	·60
Sea-weed, dried	....	18·58	65·97	1·64	1·99	15·44 (ash).	3·44	·14	·14
Air-slacked lime	....	16·58	....	....	....	1·88	75·44	....	....
Residue from calcium carbide ..	....	41·36	....	....	....	1·08	36·19	....	....
Limestone rock	Queanbeyan	1·10	....	....	....	4·70	48·20	1·22	....
Agricultural lime	Portland Cement Co.	18·43	....	....	....	23·80	Hydrate 13·80 Carbonate 43·97	....	....
Gypsum	Marulan		(Crystallised $CaSO_4$ = 92·64)			4·47	....	....	....
Cave deposit, shells, &c. ..	Cowan, Hawkesbury River	2·11	....	·82	1·00	....	35·40	1·59	·88
,, ,, ...	Macleay River	23·06	16·01	2·43	2·95	26·77	13·88	7·40	....
Deposit (coral, shell, &c.) ..	Pacific Islands	2·13	13·53	·72	·87	....	44·00	3·53	·39
Shells	Pambula River	....	....	....	....	....	44·59	·10	....
Flue deposit	Maitland	....	....	....	....	83·75	2·56	·32	·31
,, ...	Liverpool	....	....	....	....	91·17	·42	1·29	·17
,, from sanitary furnace	....	....	....	....	....	63·53	6·64	1·82	1·61
,, ...	....	6·30	2·45	....	....	84·89	·32	·35	·38
Night-soil mixed with lime ..	....	44·33		·74	·89	18·60	7·62	·78	....
Night-soil	Wagga Wagga	6·70		·03	·04	82·19	·44	·28	·69
,, ...	,, ...	9·14		·28	·34	78·92	1·18	·18	·54
,, ...	,, ...	....		·50	·61	....	....	·64	·62
Night-soil preparation, No. 1 ..	....	8·22		3·73	4·63	50·22	13·32	9·65	·91
,, ,, No. 2 ..	....	7·20		1·83	2·22	29·02	8·05	4·10	·15
,, ,, No. 3 ..	....	25·95		1 64	1·99	60·17	1·39	1·61	·70
,, preparation, "Pinhoe" manure.	....	·92	9·54	·21	·25	57·58	14 71	1·26	·56
Night-soil preparation	F. Artlett, Parramatta	7·33	30·06	2·10	2·75	46·38	2·09	1·92	·61
,, ,, ...	,, ,, ...	10·11	42·59	4·97	6·03	·94	30·12	·39	....
,, ,, ...	Mr. Halstead, O'Brien's patent	1·54	12·36	·54	·65	77·95	....	·63	....
,, ,, ...	....	29·52	56 15	2·55	3·10	14·33 (ash).	....	....	....

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET—*continued.*

Manure.	Original Source.	Water.	Volatile. and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Street sweepings	Sydney Municipal Council	61·63	19·57	·35	·43	15·45	....	·42	·28
Farmyard manure	....	67·96	22·09	·40	·49	8·16	·16	·20	·30
Stable manure	Bathurst	39·26	....	·41	·50	....	....	·27	·67
Fowl manure	....	3·95	16·48	1·47	1·78	70·16	2·10	1·94	....
,,	....	1·54	15·23	·86	1·04	79·96	·64	·59	·33
Sheep manure	Bathurst	7·73	....	1·06	1·30	....	....	·69	1·17
,,	Liverpool Wool-scouring Works	9·71	50·91	1·79	2·17	32·26	2·30	·91	·92
Sheep dag	....	....	....	3·04	3·69	....	....	....	....
Refuse manure	Abattoirs	12·00	74·51	4·14	5·03	6·56	....	1·80	....
Flying-fox manure	....	1·09	35·34	3·34	4·05	50·29	1·02	·36	1·15
Fish fertiliser	....	14·47	64·36	10·37	12·59	4·52	....	....	....
Shark fertiliser	....	9·02	68·04	10·59	12·85	3·86	....	7·27	....
Fish manure	....	10·88	59·26	6·10	7·40	5·39	9·82	8·28	....
Rabbit hair, long	Anderson, Oxford-street	8·73	88·64	14·03	17·04	3·63 (ash).	....	....	....
,, short	,, ,,	9·72	87·76	14·00	17·00	2·82 (ash).	....	....	....
Bat guano	....	14·11	17·69	1·55	1·88	28·77	13·72	11·42	....
,,	....	10·86	19·65	2·24	2·72	51·95	1·75	3·55	·15
,,	....	13·70	34·35	4·76	5·78	3·30	22·28	13·04	trace.
Bat deposit	Cave Flat, Cooradigbee	5·43	12·98	·50	·61	57·64	5·60	12·12	....
Guano deposit	Tamworth	8·75	38·40	6·17	7·49	12·85	....	9·24	....
,, ,,	,,	8·42	20·97	3·10	3·76	31·89	....	7·87	....
,, ,,	,,	14·55	29·91	3·66	4·44	15·81	....	12·98	....
,, ,,	,,	9·35	44·32	6·73	8·17	7·33	....	13·17	....
Deposit from cave	L. R. Merey, Ashford	23·75	35·57	3·63	4·29	1·65	16·32	11·28	·60
Bone breccia	Queanbeyan	5·71	....	·59	·72	9·48	42·80	3·11	....
Muck from waterworks reservoir	Maitland	4·84	17·55	·74	·90	63·42	4·56	·31	·60
Muck raked from waterhole	....	63·66	29·86	·81	·98	3·80	·96	·10	·06
Sawdust	....	33·52	62·35	·82	1·00	....	....	1·70	·05
Decayed wood, bark and leaves, bloodwood.	....	57·80		·74	·89	40·68	1·30	....	....
Decayed wood, bark and leaves, pepper-tree.	....	79·92		·8	1·08	17·77	1·50	....	....
Coco-nut oil cake	....	8·24	....	3·29	3·99	....	....	1·20	1·49
Castor cake	....	18·81	74·08	4·30	5·22	....	....	1·83	·86
Pea cake	Java	16·02	....	7·24	8·79	....	....	1·46	1·17
Bean cake	North China	14·52	80·32	6·77	8·22	....	....	1·33	1·99
Rice husks	....	42·74	42·15	1·07	1·30	13·77	·02	·03	·04
Field pea, whole plant	....	88·58	9·97	·55	·67	....	·15	·12	·49
Tares, whole plant	....	83·97	14·96	·73	·88	....	....	·11	·21
Marsh mallow, whole plant	....	79·00	17·86	·85	1·03	....	....	·14	·69
Horse bean, leaves and stalks	....	82·87	15·90	·90	1·09	....	·05	·11	·54

Winter Pasture Plot.

YANCO EXPERIMENT FARM.

J. M. PITT, Experimentalist.

ALTHOUGH excellent results have been obtained from several grasses and clovers grown in rows in the grass garden, it was deemed necessary, before they could be thoroughly recommended as likely to produce a good pasture, to determine their natural hardiness and capacity to grow well in actual competition with one another under grazing conditions. With this object in view, a permanent pasture, comprising several of the winter grasses and most suitable clovers, was laid down, under irrigation, during the autumn of 1917, and in consequence of the very good growth obtained, it has already been possible to carry out feeding trials.

A paddock, which was 1 acre in area, and which had been previously cropped with maize, root crops, Sudan grass, &c., was prepared for the experiment. The soil was somewhat poor, being of a stiff clayey nature, shallow, and overlying a much stiffer subsoil, and the yields of the preceding crops, with the exception of the Sudan grass, had been very indifferent. By ordinary cultural methods the soil was worked into a fairly fine seed-bed, and on 2nd May, 1917, the following mixture was broadcasted by hand and then harrowed in:—

Phalaris bulbosa	4 lb.
Bromus inermis	4 lb.
Chilian Clover	1 lb.
Spineless Burr Trefoils ...	24 lb.
Subterranean Clover	6 lb.

The spineless burr trefoils referred to in the above mixture are *Medicago hispida confinis* (a spineless form of Toothed Burr Trefoil), *M. arabica inermis* (a new spineless form of Spotted Burr Trefoil), and *M. reticulata*. These trefoils possess the decided advantage over the ordinary burr trefoil (*M. denticulata*) that they have no spines to the burrs. Some seed of these new varieties was originally brought from America by Mr. W. M. Carne (now on active service), and so well did they progress at Yanco that it was decided to include them in this experiment. Owing to their free seeding capabilities they are likely to remain permanent in such a pasture as that under notice.

The plot was fortunate in having ideal weather conditions for the time of germination, as the following record shows:—

Date—May	5	6	7	8	10	12	13	14	15	17	19	22	24	25	26	27
Rainfall in points.	13	3	15	10	4	5	5	7	10	2	2	15	6	4	15	1

The importance of favourable conditions at sowing time has been indicated by past experience. Owing to the clayey nature of the soil, too much rain tends to form a hard cement surface, while no rain results in the surface soil drying out too quickly. This season, however, the conditions and the germination were all that could be desired.

Helped by continuous rains, the plot made splendid headway. *Phalaris bulbosa* made rapid progress, quickly imparting a green tinge to the paddock, and stooling well, and showing good growth as the weeks ran on. *Bromus inermis*, on the other hand, made no progress worth mentioning. The clovers, as was expected, were slow, the Chilian variety growing well, as did the Subterranean, though, owing to the manner in which it clings to the ground, its growth was not so noticeable.

It was not intended to stock the ground heavily the first season, as a better stand is assured by allowing the plants to become thoroughly established and the seed of the different varieties to ripen and fall. In view of the condition of the pasture at the end of November, it was decided to turn in milking cows to feed the growth down, and some twenty cows were put on the grass for five nights (5 p.m. to 5·30 a.m.). It was noticed that the cows paid most attention to the clovers, these being more succulent than the *Phalaris*, which had thrown up long, seed-bearing stalks. However, this was eaten off in time. There was ample fodder for the whole herd for the five nights without the stand being damaged in any way, which would suggest that for five cows there would have been sufficient feed for about three weeks—so good had the growth been.

On inspecting the plot after this feeding test it was found that the spineless burr trefoils had borne a large quantity of seed. It was hard to estimate the quantity of seed of the Chilian and Subterranean clovers, owing to the smallness of the former, and the manner in which the latter is formed. *Phalaris bulbosa* seed was observed in ample quantities.

PRICE OF SULPHATE OF AMMONIA.

THE proclaimed price of sulphate of ammonia in New South Wales, Victoria, South Australia, Western Australia, and Tasmania is £18 per ton wholesale, in single bags, on railway trucks, lorry, or other vehicle at producer's works, and £20 per ton retail, for one ton or under, in single bags, on railway truck or other vehicle, at works or store.

In Queensland the prices are £19 and £21 per ton respectively.

A further provision states that when sulphate of ammonia is imported from one State of the Commonwealth to another State, the maximum retail prices for sulphate so imported shall be the actual cost into importer's store plus 10 per cent.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1917.

Lower North Coast.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

THE season under review has been one of the best potato seasons on the Lower North Coast for many years. There was undoubtedly an abundance of rain—in fact, it was thought at many stages during the growth that for good yields too much rain had fallen, and that there was danger of the tubers rotting in the ground owing to the constant saturation of the soil. With the exception of Comboyne, where an abnormally high rainfall—much above the high average—occurred and rotted the plants soon after their appearance, the vegetative development attained on the plots was exceptionally promising, but almost simultaneously throughout the district Irish Blight made its appearance in November, and the crops were almost despaired of. So rapidly did the blight develop and reduce the healthiest appearance to a mass of dry brown leaves, that it was perhaps justifiably thought that the continuance of the rain would easily wash the spores of the fungus down through the soil and infect the tubers. There seemed to be some doubt in the minds of some growers as to whether the disease was Irish Blight—it was considered to be due solely to the abnormal rainfall—but specimens of leaves and slightly affected tubers were pronounced to be Irish Blight on thorough examination by the Departmental Biologist. When the crops were harvested, however, it was found that the tubers had remained remarkably free from the disease. This was surprising in view of the badly-affected tops and of the rain which followed. There is some reason to believe that a good hilling of potatoes for the final cultivation is not only an advantage in such a wet season on account of the better drainage it affords, but is also of some value in preventing the spores of Irish Blight from reaching the tubers. This infection of the tubers is more likely to occur in open cloddy ground which has not become compacted by much rain. We have possible, therefore, the apparent anomaly that a wet season may result in less blight on the tubers when they are dug than a drier season. Whatever the explanation may be, the fact remains that although the past season on the Lower North Coast was especially conducive to Irish Blight by reason of its cool temperatures and high rainfall, and although the disease did occur in marked form in the green vegetative growth, the tubers when dug were practically free.

For the first time this season, the Departmental manure mixture known as P7, which had given good results with maize in some districts, was tried with potatoes. In all three cases on the Lower North Coast plots this manure topped the yield, the largest increase being 1 ton 7 cwt. over the unmanured plot at Wauchope. Although it is too early to forecast this mixture as the best for all seasons, it should be watched with interest. It might have been expected that it would have done well in the wet season under review.

The following are the experimenters who co-operated with the Department in carrying out the trials :—

Mr. J. W. Smith, Wauchope.
Mr. A. McM. Singleton, Mondrook, Tinonee.
Mr. J. G. Perrett, Miller's Forest.
Mr. Geo. Brown, Comboyne.

The plot at Comboyne was a failure, owing to heavy and continued rain following soon after planting.

The Wauchope Plot.

This plot was sown on 21st August, 1917. The soil, which is a somewhat clayey alluvial, but which drains well, was fairly dry at planting. Rain followed, however, soon after sowing and an excellent stand resulted, with the exception of Carman No. 1 and Surprise, which germinated so badly that their yields were not recorded.

Following are the results of the variety trial, which were manured uniformly with 2 cwt. superphosphate per acre :—

Variety.	Yield per acre.			
	t.	c.	q.	lb.
Up-to-Date	6	3	3	0
Satisfaction	5	12	2	0
Early Manistee	5	2	1	23
Manhattan	4	17	0	26
Dalhousie	4	0	1	12

Up-to-Date again showed to the fore as a heavy yielding variety suited to this district. During the last four years in which potato variety trials have been conducted on this farm, Up-to-Date has topped the yield on the last three occasions, and was only narrowly beaten by Manhattan in 1914. In this same period Early Manistee has come from being the lowest yielder to the third best variety on the last two occasions. Both these varieties are of good quality, having little or no tendency to that waxy consistency which characterises Manhattan and, in some seasons, Satisfaction when grown on these heavier soils on the coast.

Although Carman No. 1 has been tried for four or five years on these plots, it has never proved itself to compare with Up-to-Date, Satisfaction, and Manhattan for ability to yield, and it seems as if its further testing is of little value in this district.

The yields obtained from this plot are the highest which have been recorded since Farmers' Experiment Plots were commenced in this district five years ago.

Following are the results of the manurial trial, Up-to-Date being the variety used throughout:—

Manure per acre.	Yield per acre.				Cost of Manure per acre.			Value of Increase, less Cost of Manure.		
	t.	c.	q.	lb.	£	s.	d.	£	s.	d.
3 cwt. P7 mixture... ...	6	13	1	16	1	2	6	6	18	9
2 cwt. Superphosphate ...	6	3	3	0	0	9	9	4	13	10
2½ cwt. P5 mixture ...	5	15	0	17	0	18	4	1	13	6
No manure	5	6	1	25	.. ...			....		

P7 manure consists of equal parts of superphosphate and bone-dust, and costs 7s. 6d. per cwt. Superphosphate was purchased at 4s. 11d. per cwt.

P5 consists of 4 parts superphosphate to 1 part sulphate of potash, and the pre-war cost was 7s. 4d. per cwt.

The potatoes were valued at £6 per ton for the purpose of the above estimation of profit per acre due to the use of manure.

Chemical fertilisers have given substantial increases in yield in this district in seasons of low rainfall during growth (3 inches) as well as in seasons of good rainfall, such as the present. All three manures have given good profits from their use this season. Even with an outlay of 22s. 6d. per acre on manure, the foremost, P7, has given a gross profit of £6 18s. 9d. per acre.

The rainfall during the growth of the crop was as follows:—August 9 points; September, 369; October, 319; November, 1,007; December, 181. Total, 1,885 points.

The Tinonee Plot.

This plot was sown on 13th August, 1917. It is becoming realised that potatoes can be planted much earlier in August than has been the usual practice. Not only do these earlier sowings appear to give better yields, but if frosts do occur they are not to be greatly feared, as the young potato plants are in few instances killed outright. It must be recognised that in the recognised potato districts where seed is produced, potatoes have to weather through much more severe frosts than they are likely to get on the coast. On this farm some of the best potato crops have been produced from early August sowings.

The soil on this farm, which was at one time badly reduced in humus and fertility as a result of continued cropping, has now been well restored by the method of soiling lucerne or feeding lucerne hay to stock on the cultivation paddocks.

A good stand of potatoes resulted from the planting, the seed being nicely sprouted and of good quality. The growth was very satisfactory until Irish Blight affected the tops in November. Of the varieties, Factor and Dalhousie seemed to be least resistant to the disease. As stated elsewhere, the tubers harvested showed little sign of the disease.

Following are the yields of the varieties tested :—

Variety.	Yield per acre.			
	t.	c.	q.	lb.
Satisfaction	6	16	0	15
Carman No. 1	6	11	2	16
Early Manistee	6	10	3	25
Manhattan	5	18	1	5
Factor	5	18	0	19
Up-to-Date	5	15	2	11
Dalhousie	5	1	0	19

Satisfaction has usually given good yields on this farm. In previous years it has occupied first, second, and third places in variety trials. This is the first occasion on which Carman No. 1 has shown out well. In three previous years it has been almost the lowest in the yield table. Early Manistee seems to be getting better each year as it is tried. Athough Manhattan has done well in some years, it has not been a consistently good yielder here. The same may be said of Up-to-Date, which has shown well now and again. Factor is a variety worth another trial.

The results of the manurial test are as follows :—

Manure per acre.	Yield per acre.				Value of Increase, less Cost of Manure.		
	t	c.	q.	lb.	£	s.	d.
3 cwt. P7 mixture... ...	6	13	2	17	4	19	11
2½ cwt. P5 mixture ...	6	11	3	10	4	13	3
2 cwt. Superphosphate ...	5	18	1	5	1	0	8
No manure	5	13	0	23	....		

P7 shows the best gross profit per acre here. This is, however, the first year of its trial, and no general recommendation can be made for it yet. Varying results with fertilisers have been obtained on this farm. In some cases no response has been made, and the unmanured plots have yielded as well as, or better than, the manured plots. A mixture, known departmentally as P4, has given best results on the average. It is a complete manure containing sulphate of ammonia, superphosphate, and sulphate of potash. This mixture should be included in further experiments here, which are required before any definite recommendations as to fertilisers can be made.

The rainfall during growth was as follows :—August, 35 points ; September 806 ; October, 274 ; November, 990 ; December, 118. Total, 2,223 points.

The Miller's Forest Plot.

This plot was sown on 20th August, 1917, on rich alluvial soil, which had previously given an excellent crop of maize without manure. Following a winter which was all that could be desired for preparation of the ground the soil was in excellent condition at planting time, but a heavy rainfall in September consolidated the soil too quickly to ensure best results, as the soil has a fairly high percentage of clay.

The growth of the crop was excellent until about the middle of November, when Irish Blight started in the Early Manistee plot, and quickly spread through the other varieties. Later on, Carman No. 1 seemed to be the worst affected, and Early Manistee did not appear to be as bad as some of the other varieties.

The variety trial resulted as follows:—

Variety.	Yield per acre.			
	t.	c.	q.	lb.
Manhattan	4	6	0	4
Up-to-Date	3	18	0	14
Factor	3	12	2	11
Early Manistee	3	9	3	11
Satisfaction	3	3	3	7
Carman No. 1	2	6	3	14
Early Rose (local seed)	2	6	0	21

On this soil the same objection applies to Manhattan with regard to quality, it being found that the heaviness of the soil causes the undesirable waxiness of flesh. Up-to-Date, Factor, and Early Manistee have created a particularly good impression, as they do not seem to be at all well known in the district. Early Rose appears to be popular here, but it did not yield at all well in this trial.

The results of the manurial trial are as follows:—

Manure per acre.	Yield per acre.			
	t.	c.	q.	lb.
3 cwt. P7 mixture	4	6	1	10
No manure	4	3	1	16
2 cwt. Superphosphate	3	18	0	14
2½ cwt. P5 mixture	3	10	2	24

P7 was the only manure to give an increase over the unmanured plot, but even here the small increase did not pay for the cost of the fertiliser. The result of one year's trial cannot, however, be taken as conclusive. There are few instances where potatoes fail to respond to manures, and further tests may give different results, as has proved to be the experience elsewhere.

The rainfall during growth was as follows:—August, 165 points; September, 630; October, 178; November, 627; December, 423. Total, 2,023 points.

THE PROCESS OF VINIFICATION.

By way of reply to a correspondent who desired to know how he might turn a good crop of grapes into wine, a general description of the process of vinification was given in order that some idea might be formed of the necessary expenditure and the possible financial results.

The juice of the grape contains about 25 per cent. of sugar, and is obtained from the grapes by crushing and pressing them. It is then transferred to casks or vats (cement vats or others), where it starts to ferment. The fermentation is quite a spontaneous process, and it is sometimes necessary to control it in order to obtain the best results. During the fermentation the yeast cells (which are very small plants called *Saccharomyces*) act on the sugar of the must, converting it into alcohol and carbon dioxide. The sugar disappears and is replaced by alcohol; the liquid acquires another taste, and a different appearance; it is now wine. This happens in from five to six days, more or less, according to the temperature, &c. Several impurities now separate, and the liquid is taken away from them and placed in casks, in which the wine is allowed to settle until the beginning of winter, when it is racked off into other casks. After a time it is again racked, and this is repeated for a year or more, according to the quality of the wine.

From the foregoing it will be seen that apparatus is required to crush the grapes and to separate the stalks, vats and casks to contain the liquid at various stages, and a cellar wherein to carry out these operations and to store the wine.

There are two kinds of wines, dry and sweet. In the dry wines all the sugar has fermented, and there is none left. These wines are more easily made, but unfortunately the demand is nearly always for sweet wines. However, there is a sufficient demand for good, sound, clean-tasting dry wines, and this demand is likely to increase. The sweet wines are those which still contain a certain amount of sugar. To obtain them, while the must is still fermenting, at a certain moment (and to recognise the moment and carry out the operation require some care and experience) a certain measured quantity of spirits is added to the must. This has the effect of completely stopping the fermentation process. The liquid still contains a proportion of sugar, and also a quantity of alcohol which is the sum of the alcohol produced by the fermentation and that added by the vigneron. This is what is called "fortifying" the wine, and fortified wines always contain a high proportion of alcohol—higher than that in dry wines The wine will now settle down like a dry wine, and will require to be racked in the same way. The alcohol that has to be added is fairly expensive, and there are other outlays incidental to the process, so that sweet wines are more expensive to the vigneron and to the public. They also have usually to be kept longer in the cellar, and require more care than dry wines.

With regard to the financial results, the yield of wine from 1 ton of grapes is not less than 100 gallons; in some cases it is more, according to the season, the variety of the grapes, the kind of wine made, &c. The loss that takes place by evaporation and in the different rackings must not be lost sight of, nor must the interest on the capital invested, for the longer the wine remains in the cellar the greater the outlay it represents to the producer.—L. A. MUSSO.

Cheese for the Indian Market.

MATTHEW WALLACE, Dairy Instructor.

For a considerable time past there has existed a trade in Australian cheese on the Indian market, and this has received a decided impetus recently owing to the contracts placed by the Indian authorities for the troops on active service in Mesopotamia. It is not the first occasion on which cheese-makers have been benefited as a result of military operations; and providing Australia can supply the quality of cheese required for a hot and trying climate, the trade should be considerably extended when peace brings about normal conditions.

The primary consideration for this trade is a cheese which will stand extreme temperatures, and be capable of transportation without undue deterioration in quality. Suitable weights are also necessary.

In the contracts already mentioned, certain stipulations are made regarding the class of cheese suitable, and suggestions regarding manufacture are also given.

Put briefly, what is required is a firm, well-made cheese, of clean flavour and good body and texture, with well finished rinds. Anything in the nature of a soft, undercooked cheese is unsuitable, and cheese with insufficient acidity and likely to go fruity if exposed to high temperatures is not wanted.

The sizes required are loaf and medium; the larger sizes, such as those sent to the European markets, are not so suitable.

In the manufacture of this class of cheese it is essential that only good, clean milk free from taints should be used. Sufficient acidity should be developed before adding the rennet, and the curd should be slowly and efficiently cooked. The cooking temperature should be raised one or two degrees higher than that employed in manufacture for the local market.

The acidity at the time of drawing the whey is most important, as it governs, to a great extent, the quality of the finished cheese. A full acidity at this stage is most desirable, sweet or under-acid cheese being of poor-keeping quality when exposed to high temperatures. The Cheddaring process should be complete, and sufficient acidity should be developed before salting.

The finish of the cheese is also important, and the system of pressing with double bindings should be adopted, as it gives a more perfect rind to the cheese. Thorough pressing is also essential.

Cheese should be semi-mature when packed, and should be ripened in a room the temperature of which does not exceed 60 degrees Fahr.

While an over-acid cheese must be avoided, it should be clearly understood that a full acid cheese manufactured in the manner above described will offer a maximum of resistance to the high temperatures encountered, and will therefore stand a greater chance of reaching the consumer in a condition of unimpaired quality.

A good keeping cheese is what is required, and under this head would be classed cheese made from pasteurised milk. This class of cheese takes longer to ripen, and consequently is capable of being held for a greater period before reaching over-maturity, than a cheese produced under ordinary conditions of manufacture.

With the increasing development of the industry, every opportunity of extending the trade outside our own borders, and of producing the class of cheese required by our customers abroad, should be eagerly seized by the cheese-makers of Australia.

THE CATTLE TICK IN AUSTRALIA.

UNDER the above title the Commonwealth Advisory Council of Science and Industry has just published a bulletin which will be of much interest to stock-owners and to those connected with trades dependent on cattle for their raw materials. The bulletin consists of the report of a Special Committee appointed by the Council last year to review the whole position of the tick pest, present and future, and make recommendations both as to future scientific research and as to immediate remedial or preventive measures, whether by legislation or otherwise. The Committee consisted of authorities on veterinary science, stock inspectors, and representatives of the pastoral industry, and its recommendations are therefore authoritative and worthy of careful consideration by the Governments and persons concerned.

The first portion of the bulletin contains an account of the cattle tick itself, the diseases to which it gives rise in cattle, and a history of the spread of the tick in Australia. Maps of the present distribution of the tick in Queensland and New South Wales show that the whole of the coastal areas of the former State and the north-east corner of the latter are now tick-infested. The bulletin next gives a review of the losses, direct and indirect, which have been caused in Australia by the tick invasion. The Committee states that if the enormous toll the tick pest has exacted from the Commonwealth could be expressed in figures, the total amount involved would stagger the community. Each year, so long as it is allowed to continue, the pest will enforce a heavy penalty, to be met not only by the stock-owners, but by all interested in business directly and indirectly dependent upon the cattle industry, as well as by members of the general public in the increased cost of necessary commodities such as meat, milk, butter, bacon, &c. After describing the methods of eradication adopted in America and Australia, and giving a summary of the campaign for tick eradication in the United States, which has been successful in freeing over 260,000 square miles of country from the tick, and thus affords promise for similar action in this country, the Committee makes specific recommendations as to the action that should be taken in Australia. These recommendations fall under two heads: (1) That a campaign for eradication should be undertaken under Federal control; (2) That further researches on the tick, its life history, and the nature of tick fever, should be carried out in Australia.

The Executive Committee of the Advisory Council has endorsed these recommendations, and has already announced that researches on the life-history of the tick will be undertaken immediately in Southern Queensland.

Copies of the bulletin can be obtained free of charge from the Secretary of the Advisory Council, 314, Albert-street, East Melbourne.

Official Milk and Butter Records.

L. T. MacINNES, Acting Dairy Expert.

The following milk and butter records of pure-bred cattle, tested under the testing scheme of the United Pure-bred Dairy Cattle Breeders' Association of New South Wales, by officials of the Department of Agriculture, are now available for publication.

It will be noted that in these records, in addition to the yield in pounds of commercial butter, there is given the pounds of butter-fat, so that, if necessary, a comparison can be made on the latter basis. This will enable those interested to make comparisons with the results obtainable from other dairying countries.

The five additional records from Mr. S. Hordern's Retford Park stud are well above the average, the best being that of Brown May (imp.), vol. V, A.J.H.B., whose yield for 303 days was 519 lb. of butter-fat, 10,011 lb. of milk, with an average test of 5·18 per cent. All these cows keep up the reputation of their breed for high fat-testing milk, Dorothy (imp.), 4142, reaching the high average of 7·3 per cent., yielding in 273 days 4,869 lb. of milk and 357 lb. of butter-fat.

Of the three records from Mr. E. P. Perry's Guernsey herd, that of Tulip des Pres (imp.), 193, is the best, with 11,451 lb. of milk and 587 lb. of butter-fat in 365 days. This is a really splendid performance, and establishes a record for this breed in Australia. Previous to this, the New South Wales Government cow, Parson's Red Rose II (imp.), at Wollongbar, was credited with having given the best yield for a Guernsey. She gave in 1914, on pasture only, 8,865 lb. milk, 655 lb. butter. This record was put up in 363 days.

The Scottish-Australian Investment Company's herd has ten more records under review, nine covering 273 days, and one, that of the heifer Camellia XIV, being for 365 days. This heifer produced in that period 7,513 lb. of milk and 297 lb. of butter-fat. Another 2-year-old, Melba XI, has given 6,492 lb. of milk and 290 lb. of butter-fat in 273 days, an average test of 4·5. Another promising heifer in this herd is Melba XIII, whose record for 273 days is shown as 5,754 lb. of milk and 257 lb. of butter-fat, an average test of 4·4.

This time Mr. Jas. Pritchard's Ayrshire herd has only one record ready for publication. According to the custom prevailing at Numba (Mr. Pritchard's estate on the Shoalhaven), this cow has been fed on natural pastures only. If a well balanced ration had been given in addition, the yield would, without doubt, have been considerably increased.

Details are given of the rations fed to each cow throughout the testing period in three herds

Mr. S. Hordern's Jersey Herd at "Retford Park," Bowral.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.			Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Butter Fat.	Milk.		Butter.	Milk.	
	yrs.	1917.	lb.	lb.	lb.	%	lb.	lb.	
Aster (imp.), 1537 ...	8	18 Feb. ...	384	327	6,391	5·1	1·18	19½	273
Dorothy (imp.), 4142 ...	3	13 ,, ...	420	357	4,869	7·3	1·30	14	,,
Retford Pontorson, 4153	4	3 ,, ...	399	340	5,391	6·3	1·26	18½	,,
Javas Valentine (imp.), 2,111.	8	2 Mar....	476	405	7,227	5·6	1·53	24	,,
		1916.							
Brown May (imp.), vol. v	5	3 Dec. ...	610	519	10,011	5·18	1·21	20	303

In addition to the natural pasture, the cows received daily the following feed:—January, 10 lb. oaten chaff, 8 lb. bran; February, pasture only; March, 6 lb. lucerne chaff, 8 lb. bran; April, 10 lb. oaten chaff, 8 lb. bran; May, 8 lb. oaten chaff, 6 lb. bran; June, 6 lb. oaten chaff, 6 lb. bran; July, 6 lb. bran, 2 lb. crushed oats, 2 lb. maize meal; August, 8 lb. bran, 8 lb. lucerne chaff; September, 5 lb. each of oaten and lucerne chaff, 6 lb. bran; October, 8 lb. oaten chaff, 8 lb. bran; November, 6 lb. oaten chaff, 6 lb. bran; December, pasture only.

Mr. E. P. Perry's Guernsey Herd at "Nundorah," Parkville.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.			Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Butter Fat.	Milk.		Butter.	Milk.	
	yrs.	1917.	lb.	lb.	lb.	%	lb.	lb.	
La Colombe III (imp.), 92 ...	8	15 Mar....	323	275	5,755	4·7	·78	12½	273
Golden Rose IV (imp.), 78 ...	5	10 April..	422	359	7,779	4·6	1·32	20	,,
		1916.							
Tulip des Pres (imp.), 193 ...	4	7 Dec. ...	690	587	11,451	5·1	1·14	17	365

In addition to natural pasture, the following rations were given daily:—La Colombe (imp.): March, 6 lb. bran, 4 lb. molasses; April, 9 lb. bran, 5 lb. oaten chaff; May, 9 lb. bran, 5 lb oaten chaff; June, 6 lb. bran, 2 lb. boiled corn; July and August, 6 lb. bran, 4 lb. molasses; September, 6 lb. bran; October and November, pasture only.

Golden Rose IV: April and May, 6 lb. bran, 4 lb. molasses, 5 lb. oaten chaff; June, 6 lb. bran, 2 lb. boiled corn; July, 4 lb. bran, 7 lb. molasses; August, 6 lb. bran, 4 lb molasses; September, 6 lb. bran; October, pasture only; November and December, 6 lb. bran, 4 lb. molasses.

Tulip des Pres: In addition to pasture feed this cow received during December, 1916, 6 lb. bran, 4 lb. molasses, and a little hay; January, 1917, 6 lb. bran, 2 lb. molasses, 1 lb. each of cowpeas and corn boiled; February, 8 lb. bran, 3 lb. molasses, 2 lb. boiled peas; March, 4 lb. molasses, 9 lb. bran, and a little hay; April and May, 10 lb. bran, 4 lb. molasses, and 5 lb. oaten chaff; June, 6 lb. bran, 1 lb. oats, and 2 lb. boiled corn; July and August, 4 lb. molasses, 6 lb. bran; September, 9 lb. bran, 4 lb. molasses; October, 6 lb. bran; November, 6 lb. bran, 4 lb. molasses.

Mr. Jas. Pritchard's Ayrshire Herd, at Numba, Shoalhaven River.

Name of Cow.	Age at beginning of Test.	Date of last Calving.	Total.			Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Butter Fat.	Milk.		Butter.	Milk.	
	yrs.	1917.	lb.	lb.	lb.	%	lb.	lb.	
Daisy Bell of Kabibinokka ...	7	14 Jan. ...	328	279	7,375	3·6	·98	21½	273

Fed on pasture only.

The Scottish Australian Investment Co.'s Milking Shorthorn Herd at Darbalara.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.			Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter	Butter Fat.	Milk.		Butter.	Milk.	
	yrs.	1917.	lb.	lb.	lb.	%	lb.	lb.	
Daisy VI, 1355 ...	6	16 Mar....	359	306	6,774	4·5	·56	10	273
Minnie VIII, 1588 ...	6	11 ,, ...	421	358	8,821	4·0	1·08	23½	,,
Melba XI, vol. iv. ...	2	9 ,, ...	341	290	6,492	4·5	1·05	19	,,
Melba XIII, vol. iv ...	2	2 ,, ..	302	257	5,754	4·4	1·23	22	,,
Daisy XIV, vol. iv ...	2	28 Feb. ..	233	198	4,786	4·1	·92	20½	,,
Bloomer III, vol. iv ..	2	14 Mar....	210	178	4,458	4·0	·72	16	,,
Dolly XV, vol. iv ...	3	7 ,, ...	258	219	5,635	3·8	1·01	23	,,
Camellia VIII, vol. iv	5	4 ,, ...	386	328	9,121	3·6	1·43	34½	,,
Camellia XIII, vol. iv	3	21 April...	314	267	6,513	4·1	1·37	27½	,,
Camellia XIV, vol. iv	2	10 Jan. ...	349	297	7,513	3·9	·72	15½	365

The whole of the cows were fed on pasture only, with the exception of Minnie VIII, Melba XI, and Melba XIII, who received daily the following feed in addition :—March and April, 5 lb. bran, 5 lb. crushed oats, 3 lb. boiled corn, 3 lb. oaten chaff; May, June, July, and August, 5 lb. bran, 8 lb. oaten chaff, 4 lb. boiled corn; September, October, and November, pasture only.

REQUEST FOR FRESH-WATER SHELLS.

In Egypt and Africa the Bilharzia worm affects man, causing the passage of blood in the urine. The young stages of the worm are passed in certain fresh-water shells. Some of the Australian species of these shells can almost certainly act as intermediate hosts.

An endeavour is being made to ascertain the distribution in New South Wales of these fresh-water shells. This is being undertaken by Mr. Charles Hedley, of the Australian Museum, Sydney, who would be glad to receive specimens of such shells from creeks and ponds for identification.

The living shells are best dropped into a small bottle containing alcohol, into which cotton wool is also inserted, to prevent their breaking. If this is not available they could be forwarded in small boxes, with loose packing to prevent breakage.

Self-boiled Lime-sulphur Solution.

A. A. RAMSAY, Chemist's Branch.

THE use of this preparation has been suggested by American and other authorities for fungus diseases of fruit trees, and more than one inquiry has been received by the Department as to its efficiency.

The name, Self-boiled Lime-sulphur Solution, very closely resembles the name of another preparation also used for fungus diseases of fruit trees, viz., "home-boiled lime-sulphur solution," or simply "lime-sulphur solution," and the similarity of names may lead, and possibly has led, to erroneous ideas of the chemical composition of the two preparations.

The self-boiled lime-sulphur is prepared by taking a quantity of lime (8 lb.) and adding so much water that the lime on slaking causes the water to boil or to appreciably increase in temperature. The sulphur (8 lb.) is then added, together with a little more water, if necessary, to regulate the temperature and prevent violent ebullition. When the intensity of the action is over water is added to make up a definite volume, 50 American gallons, or about 42 Imperial gallons.

It has been found by experiment that quite a small proportion of the lime, and of the sulphur used, enters into chemical combination, the amounts varying with the temperature of the water used and the length of time the mixture is allowed to stand.

The percentage of sulphur which goes into solution ranges from 0·2 in the case of water at 20 degrees Cent. to 4·4 with water at 100 degrees Cent., and that of the lime used from 3·6 in the former case to 5·6 in the latter, or stated in another way, about 95 per cent. of the ingredients used do not combine. On allowing the mixture to stand for fifteen days or longer, the percentage of sulphur in solution increases to 9·8 and of the lime to 10·1.

In this preparation it is to be noted that the principal calcium-sulphur compound formed is thio-sulphate, which is considered to have a very limited fungicidal value. Smaller quantities of monosulphide and sulphate are also reduced. No polysulphides appear to be present. But calcium hydrate appears to be always present. On standing the thio-sulphate increases till it reaches 85 to 90 per cent. of the total sulphur in solution.

In using this mixture for spraying purposes then, we appear to be applying a mixture containing in 41·7 gallons, from 2 oz. to 5½ oz. of sulphur in solution, and from 5½ oz. to 7¼ oz. lime in solution, together with 7 lb. 8 oz. to 7 lb. 10½ oz. sulphur, and 7 lb. 10½ oz. to 7 lb. 8¾ oz. of lime in suspension.

The chemical composition of "lime-sulphur solutions" has been discussed in Science Bulletin, No. 13. It is there shown that in the 50—100—50 formula 91 per cent. of both lime and sulphur *go into solution*, and that the largest percentage of the sulphur in solution is as polysulphide, and that the solution contains about 184 lb. sulphur in various forms of combination per 100 gallons mixture. When diluted to winter and summer strength respectively (for deciduous trees), 41·7 gallons would contain 204½ oz. and 46 oz. respectively of sulphur in solution, and principally as polysulphide.

The above clearly indicates the essential difference between the two mixtures, and also indicates that though, unfortunately, the names by which they are known are very similar, their composition is quite different, and that the one is in no way a substitute for the other, and that each has its own particular use and function. The probability is that the self-boiled lime-sulphur mixture owes its fungicidal value less to the soluble sulphur compounds than to the sulphur in suspension.

REQUEST FOR MARCH FLIES.

In connection with the investigations being carried out by Drs. Cleland and S. J. Johnston into the means of transmission of the worm causing worm nodules in cattle from one cow to another, these investigators are desirous of obtaining as many kinds of March flies as possible from any part of Australia, and especially this State. They will be grateful to any readers of the *Gazette* if they will forward them undamaged specimens of March flies, sometimes called "Horse-flies." These may often be easily caught around horses and cattle. The dead flies travel safely wrapped up in a piece of tissue paper and enclosed in a small wooden box. The locality and date should be added. They would also like information as to the prevalence or otherwise of March flies in different districts, and when they first appear and when they are last seen. Specimens and information could be forwarded to Dr. J. B. Cleland, Department of Public Health, Macquarie-street, Sydney.

"FRUIT-GROWING IN N.S.W."

A third edition of Farmers' Bulletin No. 83, "Fruit-growing in N.S.W.—What to Grow and Where to Start," by Mr. W. J. Allen, Fruit Expert, has just been issued, and all farmers who intend planting out any fruit trees this coming winter would be well advised to procure a copy. It is a substantial publication of some seventy pages, and is divided into five sections:—The fruit districts of N.S.W.; general recommendations as to varieties; varieties thriving in specific localities; calendar for fruit districts; the cost of establishing an orchard.

Among other bulletins on fruit are those on Spraying, Fruit Drying, and Fruit Preserving, and any resident of the State engaged in any form of rural industry may obtain free copies of one or more of these on application to the Under Secretary and Director, Department of Agriculture, Lands Building, Bridge-street, Sydney.

SHEEP-BREEDING EXPERIMENTS; SALES OF CROSS-BRED LAMBS.

The Wagga Consignment.

A consignment of 200 lambs from the Wagga Experiment Farm was sold at the Homebush yards on 15th November, 1917. They formed a representative lot, resulting from the cross-breeding experiments conducted under the supervision of Mr. J. W. Mathews, Sheep and Wool Expert. All were second crosses, the matings being designed to test the respective value of rams of the short-wool breeds with ewes of long-wool–Merino crosses. The mating season extended from about the end of December to the middle of February, and the lambs, being of June and July drop, were about 4½ months old on the average. The sheep were weighed on the farm before trucking, and again on arrival at Homebush yard, with the object of showing the loss of weight in transit. This consideration was nullified, however, in the case of the Dorset Horn crosses, as they were wetted by rain before the second weighing.

It is to be noted that the consignment comprised the whole of the season's drop of each cross, so that they were not picked animals. The weights and values again illustrated conclusively the outstanding merits of the Dorset Horn for the production of very early lambs, as in every instance it leads over the other breeds in this group. The Border Leicester blood again shows to conspicuous advantage among the long-wools. The trials this year also include for the first time lambs with a cross of the Devon Longwool, this being a comparatively new breed to Australia.

The selling agents reported that the consignment met with good competition, although the market for suckers was not so good as a month before. The lambs were variable, according to cross. The Southdowns showed the best quality mutton, while the Dorset Horns gave the greatest weight. The latter were naturally the coarsest, but the extra weight compensated for this in the prices realised. The following are details of the sales:—

Cross.	Weight at Farm.	Weight at Sale Yards.	Price.	
	lb.	lb.	s.	d.
Southdown x Lincoln-Merino	71	67	23	8
Southdown x English Leicester-Merino ...	72½	69½	24	0
Southdown x Border Leicester-Merino ...	70½	67	23	6
Shropshire x Lincoln-Merino	66½	61	23	0
Shropshire x English Leicester-Merino ...	65½	61¾	22	3
Shropshire x Border Leicester-Merino ...	72	67¾	25	0
Dorset Horn x Lincoln-Merino	71½	72½	24	10
Dorset Horn x English Leicester-Merino...	75¼	73¼	24	7
Dorset Horn x Border Leicester-Merino ...	83½	80	26	0
Dorset Horn x Devon-Merino	75	74	24	0

Results from Bathurst.

A further draft of crossbred lambs was sold at Homebush on 20th December on account of the Department. These were second crosses from the Bathurst Experiment Farm, and represented the commercial stage of the departmental series of tests of various crosses in the breeding of early-maturing lambs. The ages ranged from 4 to 5 months, and as each lot comprised the whole of the season's drop of that particular cross there was a variation of up to a month in the ages of the individual lambs in each group. The test, however, was of all the greater value from the fact that the lambs were an average and not a picked lot. The consignment made a prime lot, nevertheless, and the selling agents pronounced the lambs of good quality and breeding. They especially remarked upon the "chubbiness" of the Southdown crosses. The following were the Sydney weights and prices realised for the various groups:—

Cross.	Weight.	Price.
	lb.	s. d.
Southdown x Lincoln-Merino	65	20 4
Southdown x English Leicester-Merino ...	69½	22 1
Southdown x Border Leicester-Merino ...	71	22 6
Shropshire x Lincoln-Merino	67½	21 0
Shropshire x English Leicester-Merino ...	67½	22 10
Shropshire x Border Leicester-Merino ...	65	23 4
Dorset Horn x Lincoln-Merino	71	23 5
Dorset Horn x English Leicester-Merino ...	73½	25 3
Dorset Horn x Border Leicester-Merino ..	78¼	26 1

It will be seen that weight was the main governing factor in the values realised. The superior mutton quality of the Southdown crosses, for instance, did not counterbalance the extra weight of the coarser lambs. This only bears out previous experience of the Homebush market. The Dorset Horn crosses again demonstrated their greater commercial value compared with those of the Downs breeds, their recommendations being early maturity and heavy weights. It is notable, too, that the Border Leicester blood in the ewes has in each instance shown to advantage in comparison with the other classes of ewes, and commanded the highest prices in each group. Thus the Dorset Horn on the Border Leicester crossbred ewe produced the greatest weight, and made the highest price. These results are not only consistent with those obtained in connection with the sale of the Wagga Experiment Farm lambs already referred to, but they are in conformity with the records of these trials over the number of years that they have been carried out in connection with the series of cross-breeding experiments.

The consistency of the results points to definite conclusions. The Dorset Horn has won a distinct place in cross-breeding for the profitable early lamb, and, consequently, it is not a matter of surprise that this breed has been taken up by several stud breeders, and is on the increase in New South Wales. The latest acquisition is the recent high-class importation by Mr. H. S. Henley, of Bassett Downs, Cowra, whose sheep have just completed their period of quarantine. As has been repeatedly stated, the Dorset Horn should only be used as the sire in the second cross on the Longwool-Merino ewes. It is a hardy sheep, a vigorous worker, and can always be relied upon to give a good account of itself, be the season dry or good. It has been noted during the progress of these trials that the Dorset Horn crosses survive a check better than most sheep in a dry season. These experiments provide a good pointer to the man who goes in for mixed farming—wheat and early lambs—which is now, and promises to continue, the safest and most profitable combination in agriculture.

Poultry Notes.

MARCH.

JAMES HADLINGTON, Poultry Expert.

PROMINENT among matters under discussion by poultrymen during the last few weeks has been that of the chemistry of poultry foods, and much has been said to indicate how imperfectly the subject is understood. Many poultry-keepers imagine that if they had a knowledge of the chemical constituents of different foodstuffs a balanced ration might be built up of any materials which they considered economical. But it should be realised that the feeding of poultry is subject to obvious limitations.

The poultry farmer has but a limited range of foodstuffs available that come within the scope of economical feeding. These are: wheat, maize, pollard, bran, linseed meal, cocoanut oil cake, and meat or blood meal. True, there are other grains such as oats, barley, sorghum, and millet. The use of oats and barley must be restricted to about 10 per cent. on account of fibre, and considerations of digestibility govern the use of the others, while the oil content, as well as digestibility, limits the use of oil-cake and meals to about the same percentage. We have, therefore, to fall back upon wheat, maize, pollard, and bran for, roughly, 75 per cent. of our poultry food, and these articles are so closely related both in food value and nutritive ratio that the balance of a ration cannot be materially altered by the use of a little more or less of any of them. The difficulties in this connection lie rather in the direction of the introduction of foreign matter into these articles than in the chemical values assigned to each.

The Use of a Balanced Ration.

What might be a balanced ration from a chemical standpoint might be fed to poultry and yet fail to produce results; everything would depend upon how the ration was constituted. The three main factors are palatability, digestibility, and suitability from a point of view of the capacity and requirements of the class of animal. In addition, as Henry in his "Feeds and Feeding" states, the digestibility of feeding stuffs should not be confused with their final nutritive effect. While two animals may each digest the same amount of nutrients from the same weight of a given feed, one may give far better returns for the substances taken into the body than the other. The utilisation of the nutrients of feeding materials is determined by the breed, individuality, condition of the animal, &c.

An instance might serve to illustrate one of these points: Lean meat, while highly palatable and easily digested by poultry, should nevertheless be restricted in quantity from the fact of its high proteid content. Fats, also, while palatable and fairly easily digested by them, should also be restricted because they fail to supply other requirements. Hence the necessity for a balanced ration within certain limits. Most poultry-keepers realise these things, and are guided by universal practice and the dictates of common sense. It is, therefore, better to state quantities of the various foods which go to make up a ration universally accepted as producing good results than to give tables of chemical analyses which would result in confusion, not only from the many general considerations, but because the tables themselves differ widely in many instances.

The expert in these matters (the food chemist) is not nearly so sure of his ground when making up a new ration as the person who has primed himself with a superficial knowledge of the chemistry of foodstuffs. The food chemist will tell us that the only reliable guide to the value of the ration is the result obtained from it. A properly balanced ration is, of course, economical and sound in practice; but there may be considerable variations in the nutritive ratio without there being necessarily loss of efficiency in feeding or the results obtained therefrom, as for instance a ratio of 1 to 4 or 1 to 5 (which means one of proteid to the other nutrients) has proved satisfactory for laying hens and growing stock, and has produced such good results in our laying competition, and has therefore been recommended by the Department. But it does not follow that if it was a little narrower (higher in proteid content) or a little wider, that under certain conditions as good results might be obtained. For instance, the birds would be likely to eat more or less, according to whether the ration is wide or narrow.

The Necessity for Culling.

By this time quite a number of early pullets of the past season's hatching will be coming on to lay, and it will be possible to commence culling out the unlikely-looking ones that should be laying and are not; but this should not be done too severely at this stage.

If pullets have been hatched from good stock and have been well reared, there should not be a large portion to cull out, say, not more than 10 per cent. at the outside, but even that proportion includes too many unprofitable ones to carry, seeing that it would represent a hundred hens to the thousand and the cost of keeping them 12s. 6d. to 15s. per week. Unfortunately, only too many of these inferior sorts are carried on many farms; but while culling should be regularly and systematically practised, a knowledge of the birds to be culled is necessary to prevent mistakes being made, particularly with pullets thus early in the season. It does not follow that because a pullet is not laying at a given age that she is either a drone or a bad layer.

There are systems which profess to enable the novice to cull out his bad layers, but not infrequently his knowledge of them is so imperfect that their application results in the sacrifice of many good layers. Many beginners would be infinitely better off if they had no knowledge whatever of such systems rather than the little they possess. What is happening is that measurement tests are being substituted, instead of being supplemented by observation and a general knowledge of the bird, without which a poultry farmer carries a big handicap. Short cuts of this character will not take the place of a knowledge gained by experience and observation.

Unfortunately, too, the same mistake is being made in the selection of breeding stock. Many good hens and pullets are being passed over through the application of these mechanical tests, of which the selector has an imperfect knowledge at best, and perhaps none beyond the fact that he is searching for a certain measurement and finds it in the hen that happens for the time being to be in full lay. He often fails to realise that he might be passing over hens of much higher laying capacity that happen for the time being to be resting or not in full lay. Such cases are frequently coming under notice, hence this warning. It is even better not to cull at all than to make the mistakes that are often seen. It ought not be difficult to recognise a hen of fair laying capacity ; she has generally a smart appearance and a business air about her that is not easy to mistake. Even when off laying for a while and not fresh, she still exhibits those qualities to a greater or less degree.

If amateurs would be guided more by the signs of laying qualities as set out in the standards published in these notes last month (beginning at the head), together with the advice given on the points of selection, with illustrations, in " Poultry Farming in New South Wales," fewer mistakes would be made. The one thing necessary in this connection is a knowledge of the bird other than measurement.

Selling Aged Hens.

If the advice tendered in these notes has been followed, a large proportion of the hens that have finished their second-year laying will have been disposed of by this time. There are others which will still be productive, and a sharp look-out should be kept for those as they go off. One of the difficulties encountered in the disposal of aged hens is that, through a lack of system in classing the different years' hatchings, the ages get mixed up, and in many instances the owner is unable to distinguish the 1-year from the 2-year olds. To overcome this trouble, each year's pullets should be marked before coming to maturity. This can be done with leg bands, and now is the time to mark the 1917-hatched pullets or the 1916 season's (now hens), so that they can be distinguished when the time comes to market them, after the second-year laying period is over, which will mean, say, from January to May, 1919.

New Breeding Stock.

Where new breeding stock has to be introduced, no time should be lost in making the necessary arrangements to acquire it. Better selections are possible during the next two months than later ; besides which, it is desirable that they should be settled in their new home early.

Agricultural Bureau of New South Wales.

SINCE the commencement of this movement in 1911 highly satisfactory progress has been made, as will be observed on reference to the long list of country branches, and on perusal of the notes of meetings of the various branches published herein from time to time.

The main objects of this organisation are to impart agricultural education to farmers by means of lectures and demonstrations by departmental officers, and to encourage farmers to assist one another by gathering together regularly and exchanging their ideas and experiences, principally as regards local conditions, and, of course, regarding agriculture generally.

Farmers are invited to join the local branch, and can do so by getting into touch with its honorary secretary.

In districts where no branch exists, farmers are asked to co-operate with the Department in endeavouring to establish a branch. Full particulars regarding the usual method of procedure, &c., will be furnished on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Notice to Honorary Secretaries.

It is important that regular monthly meetings should be held, and that a record of the meetings of the branches should be inserted in the *Agricultural Gazette.* Honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 14th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of the common insect pests of the district, and collections are cased as required. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Formation of Libraries.—It is suggested that each branch should arrange to establish a library for the use of members; it is thought that this would be a capital way of expending surplus funds.

Secretaries of any branches which may decide to form a complete library are invited to communicate with the Department in the matter, and they will be furnished with an appropriate list of standard works.

Each branch when formed is supplied with a set of available *Farmers' Bulletins,* and from time to time new bulletins are sent to the secretaries for addition to the files. In addition to this, individual members can also procure copies of any bulletin or publication that may be of interest to them in their particular branch of rural industry, by applying for the same through the secretary of the local branch.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Buckaroo.

At a meeting held on 24th November Mr. F. Sills read a paper, of which portion follows:—

HORSE-BREEDING FOR FARM WORK.

At a time like the present, when horses are comparatively cheap, it may be asked, "Does horse-breeding pay?" If a breeder reckons service fees, possible loss of mares, and the maintenance of the colts, he may find that he cannot profitably breed colts for sale. But that is no argument against a man breeding for his own teams.

Most forms of unsoundness are hereditary, and any peculiarity of form, constitution, or temperament is generally transmitted to the progeny. Therefore a man who breeds colts by a horse registered in the Stud Book, and possessing a Government certificate of soundness, from sound, active, staunch, working mares, must get better horses than the man who buys strange colts. In breeding horses for farm work it is advisable always to use sound, registered stallions of the same breed, as by doing so a man in time gets a good, well-bred team, even though he may start with half-bred mares. The Clydesdale will be found to be an active farm horse, and quite weighty enough for general farm work. The farmer generally breeds from his working mares, and he should see that they are sound and active. A short-legged, roomy-bodied mare is the best type to breed from. In the selection of a stallion it is well to pay attention to soundness, purity of breeding, and activity. A farm horse must be able to move quickly.

The mare can be stinted to the horse after she is 3 years old, and she generally carries her foal about 11 months, though some go over a year. The in-foal mare can be worked about the farm, but heavy loads should be avoided. The mare is most liable to slip her foal prematurely when she is about 4 or 5 months in foal, and care should be taken of her about this period. A day or so before she foals a bit of wax appears on her teats. If all is well the mare quickly gives birth to her foal. It is as well to let nature take its own course, but if help is wanted it should be given. If the navel cord does not break of its own accord, a piece of darning wool can be tied round it close to the navel and the cord cut with a sharp knife a few inches below the wool. Under these circumstances it is as well to put some disinfectant on the navel to prevent any germs getting into the foal's system and causing "joint ill."

The first milk of the mare should act as a laxative, and the foal should be watched to see that its bowels work freely. If the milk does not act satisfactorily, a dose of oil can be given to the foal. From this time onward the foal will not be much trouble. Care should be taken not to let the foal suck while its mother is sweating. The foal can be weaned at about 6 months. Colts are ready for castrating as yearlings, and if well grown they can be put to steady work at 2 or 3 years old.

Cattai.

A meeting of the branch was held on 23rd January, when a discussion took place on the state of the crops and the outlook for the coming maize crop. Subsequently arrangements were made in connection with the branch's exhibit at the forthcoming Hawkesbury District Show.

Comboyne.

A lecture was delivered before this branch on 7th February, by Mr. H. Wenholz, B.Sc. (Agr.), his subject being potato culture. At the close several questions were asked, among others being one about linseed growing, the reply to which may be summarised as follows :—

LINSEED-GROWING ON THE COMBOYNE.

If linseed could be grown successfully on the Comboyne, it would be of considerable benefit to dairymen who have to pay high prices for linseed and linseed meal for feeding purposes, owing to the high freight charges. It would be unwise to say, without experimental trials, that linseed would grow profitably, although the climate and soil should be suitable. Experience in this and other countries had shown that very fertile soil was not required for a seed crop. The seed would have to be acclimatised to ensure the best results, which meant that one year's failure should not be regarded as conclusive. The seed should also be free from weed seeds ; these were often present owing to the difficulty of separating them. The seed should also be freed from immature light seed likely to carry the " wilt " disease into the following crop.

The seed-bed should be well prepared by shallow ploughing and harrowing, so as to get it smooth and firm. A deep ploughing and a loose, uneven seed-bed caused irregular germination. The seed should be given only a shallow covering. The young plants were somewhat slow-growing and tender, and should be helped along with the aid of superphosphate, at about 1 cwt. or 2 cwt. per acre.

Owing to the difficulty there would be in keeping a spring seeding of linseed clean from paspalum and weeds on the Comboyne, autumn sowing was recommended, following some cleaning crop, such as green maize fodder, early sorghum, millet, or Sudan grass. After such a crop, if the land had been kept clean, it might be better to leave out the ploughing and to fit the land with a disc harrow, as a firm, fine seed-bed would then be assured. Linseed matured in about three months, and the first good frost would put an end to the blooming, although much seed would have been matured by that time. On the Comboyne, therefore, sowing should be in February or the beginning of March, and the seed would mature in the usually drier late autumn or early winter.

If sown in drills 30 or 40 lb. per acre should be used, and twice that amount if broadcasted. A yield of 10 or 12 bushels per acre was considered fair, but up to 15 or 20 bushels had been obtained. The present price of linseed was about £14 per ton.

Cordeaux-Goondarin.

On 28th December Mr. Hugh Cowain read a paper on grafting and budding, illustrating his remarks by practical demonstrations at the table.

GRAFTING AND BUDDING.

The propagation of fruit trees is one of the most interesting occupations of the orchardist. Trees can be raised from seed, of course, but varieties cannot be perpetuated true to type in that way, and other methods have to be adopted. Nearly all kinds of fruit trees are increased by grafting and budding, though sometimes layering is employed. Grafting is one of the oldest methods. To be successful, the stock and scion must be healthy, and nearly related. For instance, it would not be possible to graft an orange on to an apple, or *vice versa*, because between these two there is no affinity. Pears can be grafted on the quince because they are closely related.

Root-grafting must be done in the winter, say June or July, the earlier the better, as the root starts to grow some time before there are any signs of growth in the scion. The whip or tongue graft is used in this class of work and also for small nursery stock. The procedure is to take the scion (about 6 to 8 inches in length, and about the size of a lead pencil) and cut it sloping to the base ; then turn the knife and enter it about midway in the slope as though you were going to split the scion ; cut a tongue about a quarter of an inch long, turning the back of the knife slightly outwards. Then take the root and treat it in the same way, so that the sloping cuts will fit close together. See that the bark of the root and scion, at least on one side, are brought together, then bind with waxed cloth.

Crown or bark grafting is usually carried out on old trees that are unfruitful or unsuitable to the district, and is performed while the sap is flowing in spring. The whole of the main leaders should be cut back to where it is intended to graft them, only leaving a few light limbs to take the sap. Two, three, or more grafts should be placed in each limb, according to its size. Take the scion and make a sloping cut as in whip-grafting, but without the tongue. Then make a longitudinal cut in the limbs where it is intended to place the grafts, raise the edges carefully and insert the scion ; bind firmly, but not too tightly. For large stocks I prefer a mixture of clay and manure to put round the grafts in preference to wax cloth, because with the latter the stock is liable to scald or sweat. The clay, however, needs some attention to keep it moist.

The cleft graft is usually adopted in working over grape stocks ; it is cut in a wedge fashion, but thinner on one edge. The stock is split down the centre, and if the stock is large, two scions can be inserted, one on each side, bound securely, and the earth drawn up around it.

Budding is an operation which is performed by removing a bud from one tree and inserting it under the inner bark of another. It can be done in spring, summer, and autumn. I prefer the autumn, say January or February, as the buds then remain dormant through the winter and seem to start in spring with more vigour.

The shield or T bud is about the simplest. Select a one-year old shoot of the variety desired, and cut the leaves off, leaving the stalk. Make a transverse cut on the stock and then a longitudinal one across the middle of it ; then take a bud from the shoot, entering the knife well below the bud and coming out well above, and cutting the top square. There will be a portion of wood beneath the bud, but it is not necessary to remove it ; lift the edges of the T and work the bud in without force, bringing the edges over the bud and tying with wax cloth.

DEPARTMENTAL NOTE.—The Fruit Expert states that it has been found that when a clay that will not crack while drying is not obtainable, grafting wax is the more reliable.

Cotta Walla.

A meeting of this branch was held on 5th February, at which there were twenty members present. Mr. T. J. Kennedy read a very suggestive paper on the art of public speaking.

It was decided to stage a non-competitive exhibit at the forthcoming local show.

Holbrook.

The annual meeting of this branch was held on 9th February, Mr. J. Ross, junior, presiding.

The report reviewed the work of the year, indicating that several valuable meetings and demonstrations had been held. The balance-sheet disclosed a healthy condition of affairs.

The election of office-bearers resulted thus :—Chairman, Mr. T. Kendall ; Vice-Chairman, Mr. C. Hulme ; Secretary and Treasurer, Mr. F. F. Forster ; Committee, Messrs. J. Ross, junior, T. Nyhan, and F. J. Gifford.

A lengthy and interesting review of co-operative enterprises in Great Britain, France, and Germany was read by Mr. Smart, who strongly counselled any who contemplated a move in that direction to maintain local control, and to limit interest on share capital in order that purchasers might be encouraged by dividends or bonuses thereon.

Kellyville.

A meeting was held on 5th January, when Mr. H. P. Smith read a paper, from which the following paragraphs are taken :—

HONEY FUNGUS OR *Armillaria mellea.*

This is a disease of the roots of trees, which may also be found in tubers, such as potatoes, &c. It develops in the ground in the form of fine strings that grow along till they come in contact with the roots of trees, when they fasten to them. This disease is to be found often in virgin forest soils. Where it is present fructifications appear in the form of toadstools, yellow or brown in colour. It is the frequent yellow colour that has given rise to the name "honey fungus." When the disease attacks the roots of a tree, the strands of fungal hyphæ or rhizomorphs enter the tissues and destroy them.

The toadstools occur in clusters at the roots or bases of the trees attacked, and develop myriads of white spores upon the edge of their gills. These spores are dispersed by the wind, and the fungus is thus disseminated. When these toadstools are found in an orchard they should be carefully gathered and burnt. The hyphæ of the fungus collect into strands of a dark brown colour, with a hard, brittle, outer covering, that somewhat resemble fine leather boot-laces. These strands ramify over the surface of the roots, and at intervals even penetrate them. They absorb nourishment from the root, eventually causing it to decay. The trees are often called "die-backs," on account of the way in which they succumb.

In citrus trees in general these rhizomorphs lose their usual boot-lace appearance, and traverse the cortex of the root instead of ramifying over its surface, as in pome fruits. Rhizomorphs of *Armillaria* have been found upon the roots of eucalypti, lantana, bracken ferns, &c. Specimens of potatoes have been found showing the rhizomorphs of *Armillaria*, not only branching over the surface, but penetrating the tissues of the tuber.

Virgin land that has been cleared for orchard purposes should be cropped for a year before planting out the orchard, in order, if possible, to starve out the fungus, and all roots of trees turned up during cultivation should be picked up and burned. The greater the amount of cultivation to which the first crop is subjected, the greater the chance of eliminating the fungus. The rhizomorphs can live for a considerable time and travel from tree to tree ; a trench 4 feet deep dug around an infected area will sometimes stop them.

When a tree is attacked by *Armillaria* it generally shows a sparsity of leaves or foliage on its branches, and in citrus trees the leaves become somewhat dull in appearance. There are great difficulties to be overcome in dealing with this pest, as it obtains such a hold on the tissues of the root, and is itself so well protected that it is hard to attempt remedial measures without injuring the host.

The best result that I have obtained so far is—(*a*) by opening up the roots of the tree as far as possible and scraping and cutting out all wood or roots attacked by the fungus, and then burning all dead and diseased tissues ; (*b*) after cleaning and drying the roots and leaving them exposed to the sun and air, paint them thoroughly with Stockholm tar and sprinkle air-slaked lime on and around the infected parts. Sometimes a lot of the main roots may have to be cut away. If so, drive stakes into the ground and securely fasten the tree to them, so as to stop it working in the ground with the wind. Add equal parts of sand and stable manure to the ground around the tree, and run a blade of a knife up the bark of the tree for fear it may become a little bark-bound. My opinion of a badly-infected tree is that it is best to root it out, disinfect the ground, and plant another tree in its stead.

A meeting was held on 2nd February, when a discussion took place on the branch exhibit for the forthcoming district show.

Kyogle.

A meeting of this branch was held on 5th January, when the programme for the year was arranged.

Lower Portland.

At the December meeting of this branch a paper was read by Mr. G. J. Mitchell, from which the following is taken :—

Fencing in the Farm.

It always pays to have a good strong fence round the farm, as there is nothing more annoying than to have crops eaten down and destroyed by stock. The necessary tools for the work are a crosscut saw, a maul and set of wedges, a couple of axes, a mortising axe, a brace and good set of bits, mattock, spade, shovel, and bar or spud.

Two of the best timbers are ironbark and rockgum ; other kinds less durable are stringybark, turpentine, bloodwood, and forest mahogany. The rails for a split fence should be cut 9 feet 6 inches long, 5 to 8 inches wide, and 2½ inches thick. The posts should be 7 feet long, 8 inches wide, and 3 or 4 inches thick. Mortice the first hole 7 inches from the top of the post, 6 x 3 inches, the second rail 8 inches lower, 7 x 3 inches (to allow for a wider rail), and 8 inches lower the bottom hole, 6 x 3 inches, the same as the top hole. Let the post 2 feet 6 inches into the ground. It is a good plan to work a heart rail on top ; it makes the fence look better and often has to stand more strain. In shifting an old fence, it is advisable after taking it up to leave it about three months before re-erecting it, as this will add to its life.

Another good fence consists of one top-rail with three wires below, about 12 inches apart, the holes being bored in the centre of the posts.

A third fence consists of ordinary posts, say 6 feet 6 inches long by 6 x 3 inches thick, and four barbed wires. The wires should be 1 foot apart, commencing 3 inches from the top. There are different ways of fixing the wires to the posts. I consider the best is to bore holes through the side of the post, and tie the wire on with No. 10 galvanized wire, using a piece about 12 inches long. I strain the barbed wire the same way as the plain wire, tying a piece of plain wire to the end near the roller strainer. A good plan is to dip the coil of wire into a vessel of boiling tar to preserve it, especially when it is being used in damp places.

A fourth fence consists of plain wire, posts the same as in No. 3 fence, and five wires; top wire 4 inches from top of post, next 11 inches, next 10 inches, and the two lowest 9 inches apart. I use No. 8 wire, and bore the holes with a ⅝ bit. I keep the holes as small as possible on account of bush fires.

Matcham.

A meeting was held on 26th January, at which the programme for the year was arranged.

Moss Vale.

A meeting was held on 23rd January, at which Mr. L. F. Badger gave a lecture on dairy-farming.

Spencer.

A meeting was held on 26th January, when Mr. A. M. Woodbury read a paper on the crossing of varieties of plants. The paper traversed the subject in an interesting way, outlining the laws of Mendelism, and indicating their practical and economic value.

Toronto.

The annual meeting and election of officers was held on 4th December. The Secretary's report indicated that the show held by the branch on 17th November was a great success, financially and otherwise, and although the number of entries was not quite up to expectation, all the items shown were of a high standard. An increase of thirteen financial members was recorded during the year.

A meeting was held on 5th February, when arrangements were made for a visit to Hawkesbury Agricultural College. Subsequently some of the members gave interesting accounts of the propagation of roses and fruit trees. Six new members were enrolled.

Yarramalong.

At a meeting on 5th February a lecture was delivered by Mr. H. Wenholz, B.Sc. (Agr.), of which the following is a summary:—

POTATO-GROWING.

The potato is a crop of general interest, in that, where it is not grown as a farm crop, there should always be a place for it in the farmer's garden. It occupies an important place at the present time as a food in England and Europe, and is being also used in Germany for the production of power alcohol.

The natural home of the potato is a climate similar to that of the Rocky Mountains and the Andes in America, where the rainfall is not high, the days warm and the nights cool, and about 100 or 110 days between killing frosts. For this reason the best period for growth on the coast in this State is the early spring or the autumn—with the preference for the former.

The soil which produces the best yields is a deep sandy loam, well drained, and well provided with organic matter to increase the water-holding capacity. Heavy clay soils are unsuitable for the growth of this crop, but they can be greatly improved by the addition of large quantities of humus—by farmyard manure or green cover crops.

Farmyard or stable manure should not be applied immediately before a potato crop is sown; the greatest benefit from manures of that kind is usually seen during the second year, so that it should be applied twelve months or so before the potatoes are sown. Readily available nitrogenous manures like sulphate of ammonia or nitrate of soda should not be applied in excessive quantities, owing to the danger of encouraging too much top growth at the expense of tuber formation. Owing to the impossibility of obtaining potash at the present time, and also on account of the high prices of other fertilisers, the manures recommended just now for the coast are either 2 cwt. superphosphate per acre at a cost of 10s.; or 2 cwt. of a mixture of superphosphate and bone-dust at a cost of 15s. per acre. Increases of up to 2 tons per acre have been obtained on most soils on the coast by the application of these fertilisers.

As regards rotations, the most important point to bear in mind is that potato diseases remain in the ground for at least three or four years, so that it is inadvisable to crop the same ground with potatoes for four or five years. This is easily practised on the coastal farm, where the annual area under potatoes is much smaller than that of maize. After an early crop of potatoes, planted early in August and lifted in November, the land should be in excellent condition for a late maize crop.

Land for spring potatoes should be given early preparation by first ploughing in autumn. This ploughing should be deep, and the ground should be left rough through the winter. The second or spring ploughing should only be shallow, and should be followed by harrowing to conserve moisture.

It is well recognised by most potato growers that cold climate seed is best. There is a sound reason for this. Tests of immature and mature tubers for seed have always resulted in a substantial increase in favour of the immature seed. In a cold climate the growth is usually stopped by frost before the tubers have properly matured. It is possible that better seed potatoes can be produced for an autumn crop on the coast by either digging the spring crop green, or by mowing off the tops so as to ensure immature seed. It has also been observed that immature seed potatoes give rise to more vigorous plants, which are less subject to disease.

Tests of sprouted and unsprouted seed tubers have invariably given an increase in favour of well "shot" or sprouted seed. The practice adopted on many farms of putting the seed tubers away into a dark part of the barn to shoot is regarded as a mistake. It not only causes the development of long, weak, spindly shoots which are easily broken in handling, but it also delays shooting or sprouting to a large extent. This mistake has probably arisen by confusion with keeping potatoes sound in storage and in good eating condition. To keep potatoes for seed they should be spread out on shallow trays or on the ground in the lightest part of the barn, or in the shade of a building. This will encourage the early development of a short, stubby, healthy sprout, not more than ½ inch or so in length, which is the most desirable.

With regard to the size of the seed used, it is generally recognised that small seed is best. A possible explanation is that small seed is more likely to be immature seed, either from a late planted crop or from late formed tubers from a strong, healthy plant, bearing in addition several large, early-formed tubers.

Several questions, such as the use of whole or cut seed, the number of eyes in the set, the planting at different times after cutting, the use of lime or gypsum on the cut surface, the distance between the sets—all are negligible compared to the size of the set or the amount of seed planted per acre. It has been conclusively shown that the larger the set or seed piece in average size the heavier will be the yield. The cost of seed, however, usually fixes a limit to the size of the set used.

Hilling is an advantage in a wet climate or on low situations. Other advantages of hilling are (1) less risk of damage by potato moth, which finds its way down to tubers near the surface of the ground, especially if the ground is dry and cloddy; (2) less risk of infection of tubers by spores of Irish blight, which are washed down from diseased leaves to the tubers nearest the surface of the ground.

Of the varieties tried on the coast, Manhattan and Up-to-Date can be recommended, though Satisfaction and Early Manistee have also done well in some parts. Manhattan, and to some extent Satisfaction, should not be grown largely on heavy or wet soils, as they have a distinct tendency to develop waxiness under these conditions. This objectionable feature is absent on lighter sandy loams.

The main diseases of potatoes were described by the lecturer, and methods of treatment advised for their prevention. The sowing of clean seed and the use of a long rotation cannot be overestimated in importance in this respect.

The life history of the potato moth was described, showing how the young grubs may pass their lives in the leaves and stems of the plant and pupate there, emerging as adult moths about harvesting time. The following means of combating this pest were mentioned:—(1) Hilling; (2) Dig early in dry weather or on open cloddy ground; (3) Avoid covering bags with potato tops; (4) Sew the bags at once and remove quickly from the field; (5) Harrow up and pick up tubers left on the ground, boil and feed them to pigs; (6) Where spraying is practised, add ½ lb. Paris green to 50 gallons Bordeaux mixture.

Questions were also invited on maize, and a useful discussion took place.

Yurrunga and Avoca.

The first meeting of the year took place on 26th January, when the programme for the ensuing twelve months was drawn up. Eleven members joined at this meeting.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bankstown	J. W. Cunningham, Brancourt avenue, Bankstown.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	J. R. Boller, Tantawanglo.
Blacktown	B. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Buckaroo	P. J. Crowley, Buckaroo.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton, Comboyne.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kelk, Black Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Creek, Frogmore.
French's Forest	J. W. West, French's Forest.
Garra & Pinecliff	S.W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jilliby-Dooralong	K. A. Smith, Jilliby, Wyong.
Jindabyne	Sylvester Kennedy, Jindabyne.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	J. M. Firth, Kellyville.
Kyogle	M. P. Dunlop, Kyogle.
Lankey's Creek (Jingellic).	[Suspended.]
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	A E. J. Anderson, B.A., Platform-street, Lidcombe.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	T. L Williams, Meadow Flat, via Rydal.
Middle Dural	A. E. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	W. H. Paine, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Moss Vale	W. G. Bale, Moss Vale.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Fanlkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	C. P. James, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Quaker's Hill	C. Gardner, Blacktown.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, W Wyalong.
Spencer	H. J. Woodbury, Spencer.
Springside (via Orange).	E. H. Selwood, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	W. Snushall, Tallong.
Tangmangaroo	A. Thompson, Kaugiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Tennyson (North Richmond).	J. E. Sweet, North Richmond.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Tingha	J. T. Robilliard, Tingha.
Toronto	J. Froome, Knowle Farm, Toronto,
Ulan	P.S.D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wetherill Park	A. J. Hedges, Wetherill Park.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	J G. Downie, Wolseley Park.
Woonona	H. Coltman, Woonona
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yarramalong	L. Hodges, "Greylands," Yarramalong.
Yetholme	—
Yurrunga and Avoca.	F. Saville, Yurrunga.

Orchard Notes.

MARCH.

W. J. ALLEN.

Preparing Land for Planting.

THE preparation of land for either deciduous or citrus fruit orchards should be commenced as soon as possible. The earlier the ground is prepared the better condition it is likely to be in for planting the young trees. Clearing, grubbing, ploughing, and subsoiling are operations which are generally associated with the preparation of land for planting trees. It is most necessary that each operation be carried out in a thorough manner. It has been found in many districts where the land has not been thoroughly prepared and cleaned of the roots of the natural timber, that fungus diseases have been retained and have later attacked the roots of the young fruit trees. *Armillaria mellea* is a fungus which attacks a great many fruit trees in both new fruit districts and more settled areas. When it is stated that through not properly freeing land from roots such a disease as *Armillaria* is encouraged in its development, and that the result is that a very large percentage of trees is killed, the necessity for thorough attention is obvious. In the planting of citrus trees in our coastal districts, it has been found that the autumn months are favourable for young trees; citrus trees planted at this time of the year make good root development, and are not subjected to trial by hot weather and hot drying winds. In the case of low-lying and frosty situations, the planting of citrus trees will, perhaps, be better if delayed until the spring, when all danger of late frosts is over.

Harvesting.

At this season of the year the picking, packing, and handling of fruit will be engaging the major portion of the grower's time. Raisin grapes, sultanas, currants, prunes, apples, pears, and other fruits may be picked and processed when required. In the cooler districts, apple and pear harvesting is in full swing. In many orchards there is a percentage of fruit which is not quite fit for the fresh fruit trade, but which is yet suitable either for drying or pulping. In the case of apples, some growers in our high tableland districts have installed small evaporating outfits. These have been found to be of great benefit in preventing absolute waste.

Grading and Packing Fruit.

There are still some growers who do not realise the importance of good grading and packing of fresh fruit for sale. It would be a good thing for such growers to visit the markets and see the fruit as it opens up. Greater benefit would then accrue than from written or spoken statements that good grading and packing is essential if the best returns are to be obtained.

Strawberries.

It is necessary to have the land for strawberry plants in good condition if the best results are desired. If the intending planter has not raised the plants himself, he should procure them from a successful grower, and see that the parent plants are strong, fruitful, and free from disease. Autumn planting in our coastal districts is proving to be a most successful practice. Before planting, all dead leaves and runners should be removed from the new plants and the roots shortened by a least one-third of their length.

Cool Storage.

Late-keeping varieties of apples and pears may be forwarded to the cool stores, to be kept there until October and November, when the market rates are usually higher. It is most necessary when picking and packing fruit for cool storage purposes that only sound fruit should be packed. The fruit should be wrapped and kept as cool as possible from the time it is picked until it is placed in the cool store. During October, November, and December the market demands either a very good coloured red apple or one quite green. As an instance of this, it may be pointed out that good French Crabs without colour or good Granny Smiths will sell better than fruit that might be just as good for cooking, but that has some colour.

Cultivation.

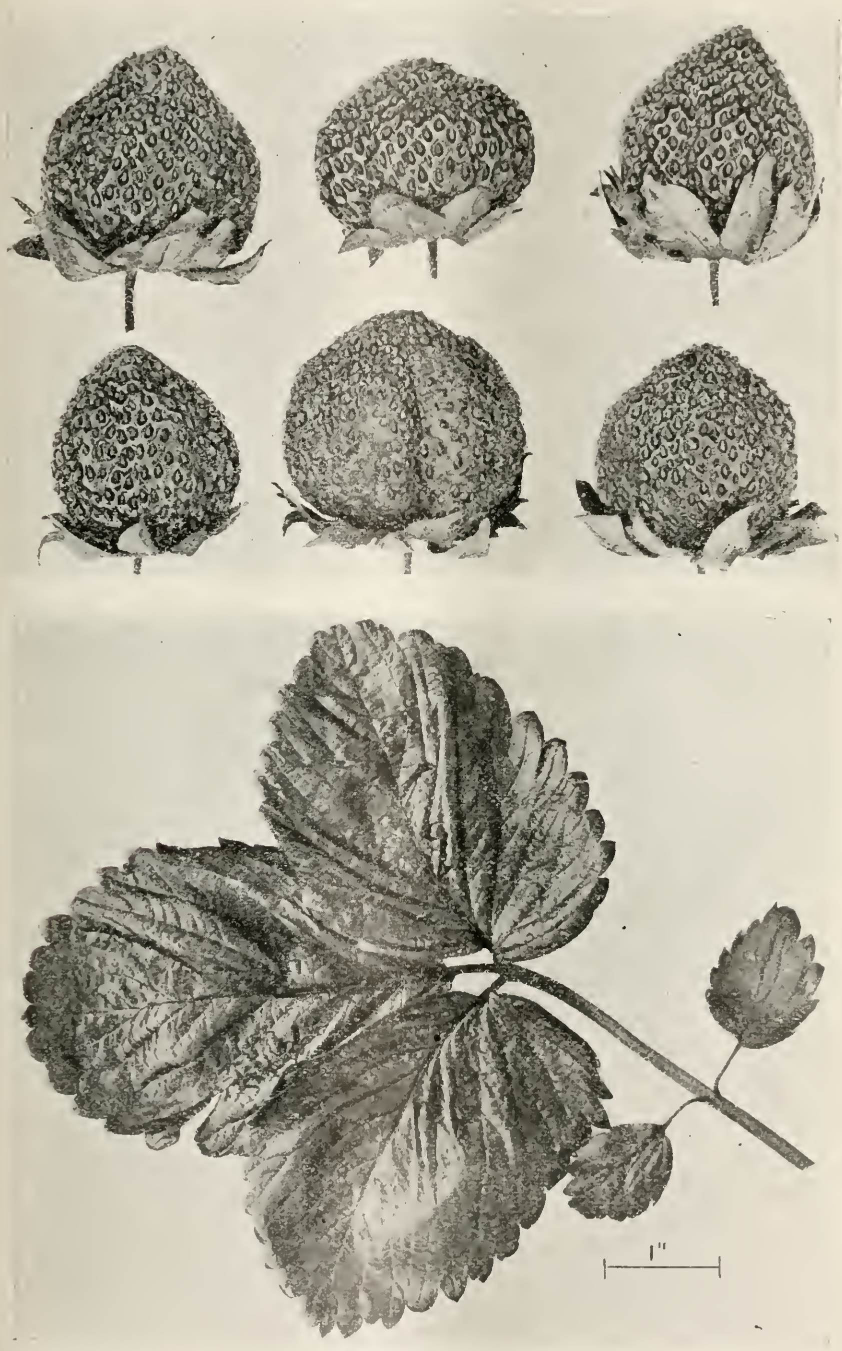
Cultivation at this time of the year is not carried out with the ordinary spring-tooth cultivators, but rather with the plough. A certain amount of weed growth may now be allowed to develop, and before getting too high it may be ploughed in as green manure. If no cover crop is to be sown, it is as well to allow the land to remain as the plough leaves it; it will then gradually mellow down and remain in good condition until it is time to plough it again in the spring.

Cover Crops.

The practice of sowing cover crops is becoming more general, as it is a cheap way of increasing organic matter. Many of our coastal soils are weak in this respect. The crops usually used for this purpose are peas, rape, vetches, rye, barley, &c. The earlier they are sown now the better. With such seeds it is generally found beneficial to sow about 60 lb. to 80 lb. of superphosphate per acre where the soil is in fair condition, and more than that quantity where it is poor.

The New Seedling Strawberry, "Illawarra."

This strawberry is a seedling grown in the Illawarra district, where it has proved a heavy cropper, carrying exceptionally large berries. The flesh is a light red colour, and the fruit is firm, of good flavour, carries well, and is splendid for jam-making and conserves. As far as it has been tried it has shown itself to be a constant and prolific bearer, and it has every appearance of proving a great acquisition to the collection of berries doing well in the Sydney district. The plant is very robust, and has a wealth of foliage.—W. J. Allen.



The New Seedling Strawberry, "Illawarra."

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

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THE

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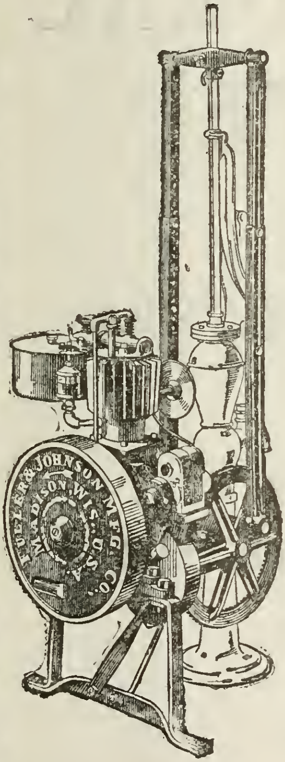
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2nd *April,* 1918.

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VOL. XXIX. PART 4. APRIL 2, 1918.

Agricultural Gazette of New South Wales.

Water on the Farm.

[Continued from page 157.]

F. B. GUTHRIE.

WATER FOR STOCK—*continued.*

Organic Matter.—The presence of organic matter in the water, which, as we have seen, is generally of benefit in the case of water to be used for irrigation, assumes a different aspect when the water is to be used for watering stock. In this case a knowledge of the origin of the water and of the nature of any organisms present, is of the first importance. If the presence of organic matter is due to sewage contamination, or to industrial waste, the water is self-condemned; if, however, it is due to vegetable contamination, as in the case of peaty waters, the question becomes more complicated, and a full chemical and bacteriological examination will be necessary in order that judgment may be passed as to its suitability or otherwise for stock.

The effect on stock of water which is peaty in character from having flowed over a peaty bottom is very different, and much less likely to be injurious than in the case of stagnant peaty water.

If stock which are accustomed to pure water are supplied with peaty water, they will usually scour at first, but provided the water is free from injurious micro-organisms or the products of decomposition, they will generally accustom themselves to it.

The matter will be more fully dealt with when the subject of water for human consumption is discussed, as in this case also the origin and nature of the organic matter is of primary importance.

Sulphuretted Hydrogen.—The presence of this substance, as in the case of water for irrigating, is highly objectionable, and the same steps must be taken or its removal, namely, storage and aeration until the odour disappears. Fortunately, its presence is readily detected owing to its disagreeable odour, and on this account stock are not likely to drink water so contaminated unless they are obliged to.

WATER FOR BOILERS AND FOR STEAM PRODUCTION.

The composition of the water to be used in boilers for the production of steam or other purposes is also a matter requiring careful consideration. Water may act injuriously in boilers in three ways:—

1. By corrosion or pitting of the metal of which the boiler is composed.
2. By the formation of an adherent deposit or scale on the surface of the boiler.
3. By priming or frothing.

Corrosion or Pitting.

This may be brought about by several agents:—

Acid waters are invariably corrosive, even waters highly charged with carbonic acid. The escaping carbonic acid mixed with atmospheric oxygen attacks iron very rapidly, and its effects may often be noticed in the steam pipes at some distance from the boilers. In addition to free acids there are several substances whose presence in the water may form free acids and corrode the metal.

Magnesium chloride, if present in the water, is decomposed at the high temperature present, and is split up, in contact with steam, into magnesium hydrate and hydrochloric acid, the latter a highly corrosive substance. Hydrochloric acid being carried over by the steam also attacks the steam pipes, as well as the boiler itself. The addition of sodium chloride (common salt) or ammonium chloride (sal ammoniac) to the boiler-feed reduces the corrosive action of waters containing magnesium chloride, as compounds are formed which are not decomposed by steam.

Animal and vegetable oils, when acted upon by steam under pressure, form free organic acids, which rapidly corrode the boiler-metal. The remedy is to use only mineral cylinder-oils, and to avoid oils of animal or vegetable origin as lubricants.

Alkaline waters, especially such as contain carbonate of soda, are corrosive. The addition of powdered gypsum (calcium sulphate) is recommended for such waters. The substance forms glauberite, a double sulphate of soda and lime, at the temperature of the boiler, and produces a deposit which can be "blown off" from time to time.

Waters rich in nitrates may also cause corrosion, as free ammonia is evolved which attacks the metal.

Boiler Scale.

This can be of two kinds:—

(*a*) The deposit formed by so-called temporarily hard waters containing calcium carbonate. This is not a true scale, but is a friable deposit forming a sludge which can be "blown off."

(*b*) True scale, which forms a hard, compact, and firmly adhering mass, which can only be removed by hammering it off. This scale is formed by "permanently hard" waters, and is due to calcium sulphate.

The above are the principal scale-forming substances, but scale often contains hydrates of magnesia and iron, silica and organic matter.

The scale formed by calcium sulphate is far the more objectionable, as it is not possible to blow it off or get rid of it by any other means than by hammering, which is detrimental to the boiler.

Scale is objectionable for several reasons:—

1. It separates the water from contact with the boiler plates, which are then liable to be burnt out.
2. It tends to clog tubes and feed pipes.

3. Owing to its low conductivity for heat, it necessitates increased consumption of fuel to raise the water to the required temperature. Even comparatively thin layers of scale affect very considerably the economical working of the boiler.

It has been found that—

Scale of $\frac{1}{6}$ inch thickness requires 16 per cent. additional fuel.
,, $\frac{1}{4}$,, ,, ,, 50 ,, ,, ,,
,, $\frac{1}{2}$,, ,, ,, 150 ,, ,, ,,

A water containing 12 parts per 100,000 of scale-forming salts will deposit over 1 ton of scale in the course of twenty days (of twenty-four hours) in a 1,000 h.-p. plant.

Priming or Frothing.

Saline, and especially alkaline, waters may also cause frothing, foam and water passing over with the steam. This is owing to the increased surface tension due to dissolved material, thus preventing the free escape of bubbles.

Mucilaginous matter is also a cause of priming, carrying solid matter over with the steam and choking the pipes.

Substances which are Objectionable in Boiler-water.

Calcium carbonate and *magnesium carbonate*, which are the salts present in temporarily hard waters, form deposits, but rarely form true scale. The deposit is caused by the escape of the carbonic acid, which in such waters holds the calcium and magnesium carbonate in solution, (see *Agricultural Gazette* for December, 1917, page 840). On the removal of the carbonic acid the carbonates are thrown out of solution and form more or less friable, lightly adherent, gritty deposits, which can generally be "blown off" without much difficulty.

Calcium sulphate, the salt which gives water its "permanently hard" character, is very detrimental, as it forms a compact crystalline mass which adheres with great tenacity to the boiler-metal, and has a low-conducting power for heat.

Calcium sulphate is particularly liable to deposit because, as has already been pointed out previously (December issue, p. 841) it is less soluble in hot water than in cold, and is insoluble in superheated steam, consequently any calcium sulphate in the original water will be thrown down when the water boils. It is doubly objectionable, because in addition to the points already mentioned as being detrimental in the case of any kind of scale, the fact that it has to be hammered off reduces the life of the boiler.

Sea-water forms a scale containing calcium sulphate and magnesium hydrate.

Magnesium sulphate is harmless unless in excess.

Chlorides, especially magnesium and calcium chlorides, as has already been mentioned, may cause corrosion.

Remedies and Precautions.

A great number of "anti-incrustators" and "anti-corrosives" are on the market. Some are less effective than others. In no case do they prevent the formation of some sort of deposit, as they do not reduce the amount of saline matter which is left behind when the water is driven off as steam, and in most cases they increase it. The best of them can only convert what would otherwise be a closely adherent scale into a friable deposit or sludge which can be blown off. The basis of their composition will be one or other of the substances enumerated below, and they will be very much more expensive than these.

Generally speaking, if any substance is added to purify the water, it is best to add it before it is fed to the boiler, when the water can be run off or filtered from any sediment deposited before it enters the boiler.

Softening temporarily Hard Waters.

As has been previously explained, the hardness of these waters is due to the presence of bicarbonate of lime, a compound formed by the solution of carbonate of lime in carbonic acid. It was also explained that this excess of carbonic acid could be removed and the water rendered soft either by boiling or by the addition of lime, in both cases the carbonate of lime being precipitated out.

In the case of water supplies for cities, the process known as Clark's process is frequently employed for softening temporarily hard waters. This process depends on the addition of lime, and as it is the cheapest and most effective method for softening boiler-waters, it will be described briefly.

Theoretically, 56 parts of lime (calcium oxide) will precipitate the lime from 162 parts of bicarbonate of lime. So that in the case of a hard water containing 20 grains bicarbonate of lime to the gallon (28 6 parts per 100,000), 7 grains of lime are required for each gallon of water, or exactly 1 lb. to every 1,000 gallons.

The lime may be added either as lime-water or as milk of lime; the former is the more accurately controlled, but requires large reservoirs to carry it out properly; and for softening comparatively small quantities such as would be required for individual supplies the milk-of-lime process is the more handy, and will be explained.

To soften the water in a 1,000 gallon tank, 1 lb. of quicklime is slaked and made into a thin milk by the addition of water in a wooden barrel, and nearly all of it run slowly into the hard water in the tank, leaving a few pints in the barrel. Allow to settle, which should take about twenty-four hours, take out some of the clear liquid in a glass tumbler, and add a few drops of a solution of nitrate of silver. If a brown colour appears enough lime (or possibly a little too much) has been added. If no brown colour is produced by the nitrate of silver, add more milk of lime, allow to settle, and test again until the water strikes a brown colour with nitrate of silver. The object of not adding the whole of the lime at once, and of testing the clear water with nitrate of silver, is to avoid adding too much lime, the effect of which would be to render the water hard again.

It will be seen that in order to soften the water satisfactorily the exact quantity of lime which is necessary to combine with the carbonate must be added, and no more.

This amount can be ascertained with very little trouble by making a test on a gallon or so, with milk of lime containing a known quantity of lime, and testing as above-described with nitrate of silver; or if any difficulty is experienced, obtain the advice of an analyst.

Softening permanently Hard Waters.

Carbonate of Soda.—In the case of waters which are hard owing to the presence of sulphate of lime, the hardness cannot be removed by boiling nor by the addition of lime, and recourse must be had to other softening agents The most commonly used substance is carbonate of soda (soda ash). The reaction between these compounds has been explained already when the neutralisation of alkali in bore water was under discussion (page 155 of the March issue). In that case calcium sulphate or gypsum was added to water containing carbonate of soda, and it was shown that the result was the formation of calcium carbonate and sulphate of soda. The same reaction takes place when sodium carbonate is added to a water containing calcium sulphate.

Theoretically, 78 parts of sodium carbonate react with every 100 parts calcium sulphate. Here again it is necessary to add as nearly as possible the exact amount required, and the composition of the original water should have been determined previously. The water after the addition of the soda should be very faintly alkaline. The best way to test this is to take a little of the clear water in a glass and add a few drops of phenol-phthalein, which should give a faint pink tinge to the water.

It must not be forgotten that the addition of any anti-incrustator, such as sodium carbonate, can only prevent the formation of the hard adhesive scale which is so objectionable. Saline matter will always be thrown down in the form of a mud or sludge, which must be blown off periodically from the highest to the lowest water-level.

Other Substances used for Purifying Boiler Waters.

a. ANTI-INCRUSTATORS.—*Caustic soda* is often applied when both calcium carbonate and sulphate are present, the soda converting the calcium carbonate into sodium carbonate, and this in its turn acting on the calcium sulphate in the manner described above. It can, however, only be used alone when the calcium salts are present in certain definite proportions. When this is not the case either lime or sodium carbonate must be used in addition.

Sodium aluminate, a compound of alum and soda, can be employed successfully for softening waters containing calcium carbonate, but it has no action on calcium sulphate.

Sodium phosphate is sometimes used, and has the advantage that the precipitate formed is more flocculent than that produced by sodium carbonate, and less liable to adhere. It is, however, very much more expensive and it must be used hot, so that it cannot be added to the water before it is fed to the boiler. Neutral sodium phosphate must be used; the acid phosphate corrodes the boiler.

Sodium fluoride forms a flocculent and voluminous precipitate with calcium carbonate, which is easily blown off. It has the advantage over those previously mentioned, that it is not alkaline.

Permutite is an artificially-made double silicate of alumina, similar in composition to the naturally occurring zeolites. It is used for softening water for household purposes, and is also effective as an anti-incrustator.

Tannin, sodium chromate, graphite are all used as anti-incrustators, but it must be borne in mind that the addition of any substance, and particularly of any saline matter in excess, is liable to induce priming or frothing.

Kerosene has a mechanical action in preventing the scale from adhering to the boiler by coating the particles with a very thin film of oil. Only refined kerosene or petroleum must be used, and, as it is volatile, its effects are not lasting.

(*b*) ANTI-CORROSIVES.—Good results are often obtained by attaching zinc plates to the boiler-bracings, or even by hanging zinc plates or spheres in the water. The object is to set up galvanic action in which the zinc is attacked and the boiler metal saved at the expense of the zinc.

Chromates have been used for the same purpose—the prevention of the corrosion of iron. It is found that chromic acid and its salts have a peculiar action on iron by rendering the surface of the metal "passive" and less liable to be corroded.

Common salt and *sal ammoniac* have already been mentioned as being effective in the prevention of pitting due to the presence of magnesium chloride in the water.

It will be seen from the above that there is no absolutely certain means of preventing the formation of boiler scale, even when the composition of the water is known. At best, any substance used is only an ameliorant. The question is complicated because the addition of any foreign substance does not prevent the formation of a deposit, but, on the contrary, tends to increase its amount, and is liable, by introducing soluble matter, to produce frothing and priming. The only legitimate use of such anti-incrustators is to convert the scale-forming salts into a sludge or mud which can be easily got rid of, and to prevent the formation of true scale.

These ameliorants are also best added to the water before it enters the boiler. The question is further complicated by the fact that the formation of scale, priming and corrosion depend largely upon the type of boiler used, the nature of the metal, and the temperature and pressure.

It is therefore not possible to draw up any standard of purity for waters to be used in boilers.

(*To be continued.*)

Farmers' Experiment Plots.

WHEAT AND OAT EXPERIMENTS, 1917–18.

Riverina and South-western Slopes.

H. C. STENING, Inspector of Agriculture.

WHEAT experiments were conducted during the 1917 season in fifteen different districts throughout Riverina and South-western Slopes.

The following are the names and addresses of the wheat-growers who undertook to carry out the experiments on their farms in co-operation with the Department:—

M. J. Carew, "Selbourne," Deniliquin.
J. Charles, "Stoneleigh," Grong Grong.
W. Cruickshank, "Eurowie," Marsden.
R. O. Eulenstein, "Gracevale," Henty.
D. and J. Gagie, "Spy Hill," West Wyalong.
F. Gollasch, "Pine Park," Milbrulong.
E. W. L. Gordon, "Yanterilla," Tubbul.
H. M. Hall and Sons, "Studbrook," Cunningham.
H. J. Horsburgh, "Wyuna," Beckom.
C. H. Hulme, "Burnley," Holbrook.
Johns Bros., "Wollongough," Ungarie (R. B. Robb, Manager).
A. McDonald "Bright-View," Balldale.
H. G. M. Thackeray, "Wootoona," Young.
W. Thornton, "Spring Farm," Berrigan.
E. G. Wenke, "Sunnyside," Walla Walla.

In every locality variety and fertiliser experiments were carried out, and on some farms additional tests were made, such as rate of seeding, fallowing, crop-harrowing, acclimatised *v.* introduced seed, early *v.* late sowing, &c.

At each centre the total number of plots was from thirteen to seventeen, each plot being three-quarters of an acre in area. As the experiments at Holbrook and Cunningham were not considered fair tests, the plots were not harvested separately. At Holbrook flood waters from a neighbouring creek caused the experimental area to be inundated for some days, which killed a considerable portion of the crops. The experimental area at Cunningham was invaded by rabbits, which kept the crops grazed close to the ground until late in spring; an excellent opportunity was thus afforded for sorrel to take possession of the land, which had been in cultivation for about thirty years. The sorrel inhibited the growth of the wheat in large patches, and precluded the possibility of obtaining comparable yields.

In order that late and early maturing varieties could be sown seasonably, two sowings were made in all districts except three, viz., Deniliquin, Berrigan and Walla Walla.

The Season.

It is most extraordinary that there should have been two consecutive seasons of such abundant rainfall as 1916 and 1917. In many respects these two seasons were very similar; in some districts the rainfall for 1917 was a little less than the previous year's registration, but in others it eclipsed all previous records.

Frequent heavy rains fell throughout the summer of 1916–1917, which caused the fallows to set hard and encouraged prolific weed growth, necessitating the use of the disc-cultivator. This implement pulverised some of the soils too finely. The months of March and April on the whole were very dry, and in consequence, all the April sowings were made on dry seed-beds. The extent of the rains during the fallow period from the time of ploughing till time of seeding is shown in Table I.

TABLE I.—Showing the Rainfall during the Fallow Period, Riverina and South-western Slopes, 1916–17.

Month.	Grong Grong.	West Wyalong.	Deniliquin.	Millbrulong.	Marsden.	Ungarie.	Young.	Beckom.	Balldale.	Walla Walla.	Tubbul.	Berrigan.	Henty.
1916.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
August	..	..	171	..	..	..	351	..	..	..	..	168	..
September	473	252	189	294	.	..	222	..	..	..	289	298	..
October	275	210	176	347	191	267	341	253	393		473	249	..
November	192	208	166	352	182	221	143	274	287	325	280	230	383
December	105	153	278	229	329	119	352	185	92	204	335	195	204
1917.													
January	210	384	49	175	203	334	30	217	373	245	308	369	90
February	81	212	141	156	128	167	122	90	232	154	133	74	132
March..	45	114	49	64	80	110	3	84	30	124	228	28	57
April	73	21	23	36	..	22	54	80	35	63	176	33	32
May	..	..	76	57	..	..	0	..	50	117	..	95	54
Total during fallow period	1,454	1,554	1,318	1,710	1,113	1,240	1,618	1,183	1,492	1,232	2,222	1,739	952

Serviceable rains fell during May, although in a few districts there was only sufficient to cause the seed to germinate in patches, and a complete germination was not effected until the general rains on 5th and 6th June. In many districts showers fell almost continuously throughout June, causing a suspension of sowing operations until towards the end of the month.

During the growing period the rains were greatly in excess of requirements, particularly during October and November, the development of the red-rust fungus being encouraged; high winds, combined with the rains, caused some crops to lodge. However, the crops generally were not so soft and sappy as in the previous year, and consequently they resisted both the rust and the storms more successfully. An exception was at Tubbul, where a heavy rain and windstorm on 1st December completely flattened out the crops.

At Henty the plots were located on low-lying land that was water-logged throughout the winter and spring, and in consequence the growth was retarded and the production of satisfactory yields was prevented.

A hailstorm occurred at Young on 23rd September, and the crops of Federation, Hard Federation, and Canberra, which were more advanced than the other varieties, were severely damaged. Second growth was made, and while poor yields were harvested from the Federation and Hard Federation, a very fine crop of Canberra was produced, which yielded nearly 28 bushels.

Table II shows the distribution of the rainfalls during the growing period at the farms where the experiments were conducted.

Harvesting Improved Steinwedel Wheat at West Wyalong.

TABLE II.—Showing the Rainfall during the Growing Period, Riverina and South-western Slopes, 1917.

Month.	Grong Grong.	West Wyalong.	Deniliquin.	Millbrulong.	Marsden.	Ungarie.	Young.	Beckom.	Balldale.	Walla Walla.	Tubbul.	Berrigan.	Henty.
1917.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
April	..	..	..	..	..	..	..	..	..	..	..	..	..
May	134	126	..	131	102	96	235	77	132	146	262	..	60
June	175	144	464	226	200	137	377	163	354	364	416	330	383
July	50	224	181	380	82	207	355	182	303	391	384	188	332
August	201	268	260	265	234	175	462	249	254	298	390	205	295
September	398	150	204	255	162	190	222	120	239	262	301	168	337
October	157	334	401	290	260	248	352	325	358	417	389	393	477
November	323	434	332	502	420	434	433	345	366	365	340	250	383
December	..	..	..	20	..	..	145	6	64	118	101	..	162
Total during growing period	1,438	1,680	1,842	2,069	1,460	1,487	2,581	1,467	2,070	2,361	2,583	1,534	2,429
Total during growing period of the late-sown crops..	1,304	1,554	..	1,938	1,328	1,391	1,969	1,390	1,590	..	2,321	..	1,996
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. b.	b. lb.	b. lb	b. lb.
Average yield of varieties..	32 18	30 5	27 16	26 34	24 32	24 28	24 22	22 0	21 10	21 0	19 34	19 18	11 42

In order to show the relation between rainfall and yield, the average yield from all varieties at each locality is also given. The plot where the lowest rainfall was recorded, viz., Grong Grong, has returned the highest average yield; and of the eight districts giving the best average yields only two registered more than 20 inches, and these were located on well-drained slopes. Of the five plots that averaged lowest, the rainfall was below 20 inches at only one, and that was Berrigan, where the low yield was due to the ravages of mice, which destroyed fully 50 per cent. of the seed shortly after sowing, very thin stands being the consequence.

These comparisons of yield and rainfall support the inference from the previous year's results that a precipitation of more than 20 inches during the growing period is inimical to the production of high yields.

Soil and Cultural Notes.

Grong Grong.—The soil was a red loam; cropped for the second time; ploughed 4½ inches deep, and harrowed at the end of August, 1916; disced and harrowed before sowing; early sowing made on a dry seed-bed on 24th April, at the rate of 47 lb. seed and 42 lb. superphosphate per acre; late sowing made on a moist seed-bed on 30th May, at the rate of 56 lb seed and 56 lb. superphosphate per acre; harrowed after drilling; harvested 15th December. Warden and Yandilla King lodged.

West Wyalong.—Soil red loam, which had produced five crops previously; ploughed 4 inches deep in August; disced early in March; early sowing made on a dry seed-bed on 25th April, at the rate of 50 lb. seed and 56 lb. superphosphate per acre; late sowing made on a wet seed-bed at the rate of 60 lb. seed and 56 lb. superphosphate per acre. The late-sown crops were severely thinned by the ravages of mice; harvested 13th December. Canberra, Bunyip, Steinwedel, and Warden were badly damaged by storms, with consequent loss of grain.

Deniliquin.—Grey loam; new land; ploughed 5 inches in July; spring-toothed in March and again in April; harrowed in May; drilled on 16th May on a moist seed-bed, at the rate of 47 lb. seed and 56 lb. superphosphate per acre; crops harrowed at the end of June; harvested 2nd and 3rd January, 1918. The crops of Canberra, Improved Steinwedel, Bunyip, and King's Early lodged.

Milbrulong.—Red loam; old land; ploughed 5 inches deep first week in September; harrowed 9th October; scarified 4th and 5th November and again on 20th and 21st March; harrowed 11th April; early sowing made on 7th May on a moist seed-bed, at the rate of 50 lb. seed and 56 lb. superphosphate per acre; late sowing made on 5th June on a moist seed-bed, at the rate of 58 lb. seed and 56 lb. superphosphate per acre; crops harrowed 13th September. Stands were thin as result of the depredations of mice. Early varieties harvested 15th December, late varieties 22nd December.

Marsden.—Red loam soil, which had carried seven crops previously; ploughed 4 inches early in October; skim-ploughed 1st April; cultivated across; early sowing made on 27th April on a dry and cloddy seed-bed, at the rate of 48 lb. seed and 42 lb. superphosphate per acre; late sowing made on 25th May on a dry and cloddy seed-bed, at the rate of 58 lb. seed and 56 lb. superphosphate per acre; harvested 15th December. Stands were thin owing to depredations of mice. The grain of all varieties, excepting Canberra and Yandilla King, was "pinched."

Ungarie.—Red loam; new land; ploughed 4 inches deep in September; disced in March; early sowing made on 26th April on a dry seed-bed, at the rate of 46 lb. seed and 42 lb. superphosphate per acre; late sowing 26th May on a moist seed-bed, at the rate of 50 lb. seed and 56 lb. superphosphate per acre; harvested 14th December.

Wheat Experiments at Grong Grong.

Clarendon (late sowing), 31 bushels 6 lb per acre.

Canberra (late sowing), 34 bushels 55 lb. per acre.

Young.—Red loam; four crops previously; ploughed 5 inches deep at end of July; harrowed in spring; prior to sowing disced, harrowed, and cross-harrowed; early sowing made on a moist seed-bed on 4th May, at rate of 48 lb. seed and 56 lb. superphosphate per acre; late sowing on 21st June on a moist seed-bed, at rate of 56 lb. seed and 56 lb. superphosphate per acre; harvested 28th and 29th December. Late-sown crops were thinned by mice, and a hailstorm on 23rd September severely damaged the crops of Federation, Hard Federation, and Canberra, which subsequently made second growth. Grain of all varieties, excepting Canberra, Warden, and Cleveland, was pinched.

Beckom.—Red loam; four crops previously; ploughed 4 inches in September; disced 1st March and again on 1st April; early sowing made on a dry seed-bed on 30th April, at the rate of 50 lb. seed and 56 lb. superphosphate per acre; late sowing made on 29th May, at the rate of 56 lb. seed and 56 lb superphosphate per acre; harvested 19th December. The ravages of mice were responsible for thin crops.

Wheat Experiments at Grong Grong.

Yandilla King (mid-season sowing),
33 bushels 20 lb. per acre.

Warden (mid-season sowing),
31 bushels 44 lb. per acre.

Balldale.—Red loam, cultivated for over twelve years; ploughed 5½ inches in September; harrowed in October; disced second week in April; harrowed first week in May; early sowing made 8th May on a moist seed-bed, at the rate of 54 lb. seed and 56 lb. superphosphate per acre; late sowing on 23rd June on a wet seed-bed, at the rate of 62 lb. seed and 56 lb. superphosphate per acre; harvested 19th and 28th December. The crops were thin as a result of depredations of mice on the seed and seedlings.

Walla Walla.—Red loam; seven crops previously; ploughed 5 inches in October; harrowed in November; scarified in the middle of March; drilled 10th May on a wet seed-bed; harvested 31st December and 2nd January. The crops were thinned by mice. Marshall's No. 3 and Currawa lodged in patches.

Tubbul.—Red loam; new land; ploughed 5 inches in August; disced and harrowed first week in April; early sowing made on a moist seed-bed on 2nd May, at the rate of 50 lb. seed and 42 lb. superphosphate per acre; late sowing made on a moist seed-bed on 6th June, at the rate of 56 lb. seed and 56 lb. superphosphate per acre; harvested 28th and 29th December. All crops, excepting the late-sown Federation, lodged badly, and only portions of the yields were recovered. The grain of all varieties, excepting Canberra and Bomen, was pinched.

Berrigan.—Chocolate clay loam; about seventeen years under cultivation; ploughed 4½ inches in July; harrowed in July; disced in February and again early in May; harrowed and cross-harrowed prior to drilling; sown on 18th May on a moist seed-bed, at the rate of 50 lb. seed and 56 lb. superphosphate per acre; harvested 27th and 28th December. Mice destroyed fully 50 per cent. of the seed, and the lodgment of water in depressions killed patches of the crops. Canberra lodged.

Henty.—Red loam, in cultivation about thirty-five years; ploughed 6 inches end of October; harrowed and cross-harrowed first week in November; spring-toothed and harrowed prior to sowing; early sowing made 11th May on a moist seed-bed, at the rate of 52 lb. seed and 56 lb. superphosphate per acre; late sowing made 19th June on a wet seed-bed, at the rate of 58 lb. seed and 56 lb. superphosphate per acre; harvested 31st December and 1st January. The crops were thin owing to depredations of mice. The land was water-logged through the winter and spring months, precluding the possibility of high yields.

Variety Trials.

In ten districts, two sowings were made, so that the early-maturing varieties could be sown seasonably during the latter portion of the sowing period. All varieties were manured with 56 lb. superphosphate per acre, excepting at Grong Grong, Ungarie, Marsden, and Tubbul, where 42 lb. per acre, was the quantity applied to the early-sown crops.

Federation and Yandilla King were grown in every district, and the yields, therefore, afford a basis for comparison with other late and mid-season varieties; Federation and Canberra will serve a similar purpose with the varieties included in the late sowings. As was the case in the previous season, the rain in spring and early summer provided a long growing period, which favoured the late-maturing varieties, such as Yandilla King and Major, which have returned the highest yields of the early-sown crops.

A wet season is generally considered unsuitable for *Federation*, yet the average of the yields of this variety on all plots is 23 bus. 48 lb., which is most satisfactory. The best yields for this variety were obtained in those districts where the rainfall during the growing period was less than 20 inches. In three of these districts Federation was top-yielder, and at Deniliquin it returned the highest individual yield on the southern plots, viz., 37 bus. 40 lb. While rust was much in evidence on this variety, not very much damage was done by the fungus, and in all but three or four districts the grain sample was most satisfactory.

TABLE III.—Showing Results of Variety Trials, Riverina and South-western Slopes, 1917.

(*a*) Early and Mid-season Sowing.

(45 to 60 lb. seed per acre; 42 to 56 lb. superphosphate per acre.)

Variety.	Grong Grong.	West Wyalong.	Deniliquin.	Milbrulong.	Marsden.	Ungarie.	Young.	Beckom.	Balldale.	Walla Walla.	Tubbul.	Berrigan.	Henty.
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.
Federation ..	29 27	32 58	37 40	24 17	25 42	31 17	†15 28	21 55	20 44	20 40	*20 17	18 19	10 47
Yandilla King ..	*33 20	30 41	27 29	30 43	24 36	27 56	30 11	22 23	19 48	19 56	*20 9	20 48	13 0
Major .. .	34 40	31 10	32 45	28 51	18 41	..	33 44	22 39	19 47	21 48	*23 52	23 1	12 21
Warden	*31 44	*27 25	25 35	25 0	20 15	..	30 0	24 28	21 15	18 25	..	21 24	12 52
Bomen	..	..	..	28 52	..	..	..	22 5	21 40	27 31	..	23 37	11 16
Marshall's No. 3 ..	..	..	..	..	..	..	25 47	..	21 52	*21 27	*16 48	..	14 52
Roseworthy ..	.	..	..	..	..	..	27 16	..	20 32	20 8	..	..	12 48
Penny	.	..	..	26 20	..	..	..	..	..	..	*16 13	..	10 55
Currawa	..	33 16	..	..	..	..	..	25 3	14 58	*19 39	..	..	..
Cleveland	..	..	..	..	..	..	28 9	..	..	19 39	..	..	..
Marquis	..	..	..	..	..	..	..	..	20 51	..	..	..	..
Improved Steinwedel.	..	..	*22 36	..	..	..	..	..	..	..	..	20 33	..
Canberra	..	..	*27 23	..	..	..	..	..	..	..	..	*13 29	..
Bunyip	..	..	*26 44	..	..	..	..	..	..	..	..	..	..
King's Early ..	..	..	*23 29	..	..	..	..	..	..	..	..	..	..
Clarendon	..	..	21 47	..	..	..	..	..	..	..	..	..	..
Hard Federation ..	..	..	..	..	..	..	..	..	..	..	..	13 25	..

(*b*) Late Sowing.

(50 to 65 lb. seed per acre; 56 lb. superphosphate per acre.)

Variety.	Grong Grong.	West Wyalong.	Deniliquin.	Milbrulong.	Marsden.	Ungarie.	Young.	Beckom.	Balldale.	Walla Walla.	Tubbul.	Berrigan.	Henty.
Federation ..	33 29	31 26	..	24 5	25 19	25 43	†10 55	..	21 3	.	22 13	..	8 41
Canberra	34 55	*28 19	..	31 35	29 53	26 39	†27 52	22 49	30 19	..	*19 15	..	13 15
Bunyip	..	*26 23	..	17 19	..	23 34	..	20 25	..	..	..	..	..
Improved Steinwedel.	31 47	26 0	..	..	..	23 40	..	17 23	..	..	..	..	..
Hard Federation ..	30 19	31 51	..	..	25 56	23 48	†14 17	..	..	..	..	..	7 45
Clarendon	31 6	31 42	..	..	..	..	..	..	..	..	..	..	..
King's Early ..	..	..	..	28 37	..	..	..	20 53	..	..	..	.	..
Bomen	..	..	..	..	25 56	..	..	..	..	..	*25 6	..	..
Florence	..	..	..	..	..	18 31	..	..	..	.	*12 15	..	..
Comeback ..	..	27 0	..	..	..	..	..	..	..	..	..	..	..
Cedar	..	32 55	..	..	..	..	..	..	..	..	..	..	..
Firbank	..	..	..	..	..	19 8	..	.	..	..	..	..	..

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* These crops were so badly damaged by windstorms that the total yields could not be recovered. The yields are therefore not strictly comparable.

† These crops were cut by a severe hailstorm on 23rd September, and subsequently fresh growth was made. The yields are those harvested from the second growth.

Yandilla King proved fairly rust-resistant, and returned an average yield on all plots of 24 bus. 43 lb., or 1 bushel per acre better than Federation. These two varieties have been grown in all districts in the south for six years, and the comparison of the average yields for this period is in favour of Federation to the extent of a quarter of a bushel per acre.

The season was very favourable for such a late maturing wheat as *Major*, and the results of the tests strengthen the high opinion of the variety formed last year. It was top-yielder in three districts, and the average of its yields was 25 bus. 16 lb., or 51 lb. per acre better than the average of the yields of Yandilla King in the same districts. In normal seasons it is expected to be too late in maturity to be so successful in the drier areas, but it may be strongly recommended for the cooler portions, particularly on "strong" soils where crops tend to lodge, for it will stand up better than any other variety in general cultivation. It is liable to rust.

Warden has proved itself a tip-top dual-purpose variety. It has returned satisfactory yields of grain, but its strong recommendation is its capacity to yield heavy crops of hay of prime quality. Unfortunately it matures rather late, but is earlier than Zealand.

The results of the tests with *Bomen* have again emphasised its merit as a dual-purpose wheat. It gave the highest yield in two of the six districts in which it was tested, and the average of its yields exceeds the average of the yields harvested from any other variety sown early in the same six districts. It is also in great favour as a hay variety, is rust-resistant, and stands up splendidly for a tall variety. Bomen has now been tested on the experiment plots for five years with great success, and it is remarkable that it is not more extensively grown.

Wheat Experiments at Grong Grong

Major (mid-season sowing), 34 bushels 40 lb. per acre. Federation (late sowing), 33 bushels 29 lb. per acre.

Marshall's No. 3 as usual yielded well in the eastern portions of the district. It was top yielder in two of the six districts where it was tested, but the average at the six centres was not as high as that of Yandilla King at the same places. This was due mainly to the fact that it possesses a weaker straw than Yandilla King, and therefore suffered loss owing to lodging.

Roseworthy, which comes from South Australia, was tried for the first time on the experimental plots. It appears to be a selection from Marshall's No. 3, possessing characteristics very similar to that variety, but having a stronger straw. If it proves as satisfactory as a yielder, it will be a valuable acquisition. In this season's test it beat Marshall's No. 3 at Young, but the average yield was $\frac{3}{4}$ bushel behind the average yield of the older variety in the same districts. However, the crops of Roseworthy were on the whole much thinner than those of Marshall's No. 3, and probably further trials may prove it quite as good a yielder.

Currawa was tested in four districts, in two of which it returned the highest yield ; its average yield was about equal to that of Yandilla King in the same districts. In addition to weakness of straw, the grain of this variety was peculiarly affected in some instances ; some of the grain was pinched and discoloured, while the skin covering the germ of much of the normal-sized grain was brownish-black in colour. Affected samples are not in favour with millers. Tests have proved that the germinating capacity of the affected grain is not appreciably diminished.

Wheat Experiments at Milbrulong.

King's Early (late sowing), 28 bushels 37 lb. per acre.

Penny (early sowing), 26 bushels 20 lb. per acre.

Penny is a variety on its first trial in the experiment plots. It originated in Western Australia, and possesses characteristics somewhat similar to Dart's Imperial. It was tested in three districts, but it was outyielded by standard varieties in each instance.

The other late-maturing varieties tested were *Cleveland* and *Marquis*. Although the season should have been favourable for them, the results are not very satisfactory in comparison with other varieties.

With regard to early-maturing varieties, there is one variety which stands out above all others, and that is *Canberra.* It was tested in all the late sowings, viz., ten, and it was top-yielder in every district but two, and in those there was loss of grain due to lodging. Canberra returned a yield of just under 35 bushels at Grong Grong, and the average of the yields in all the late-sown plots was 26½ bushels, which is the highest average of all varieties grown in the same districts, whether they were sown early or late. This is a truly remarkable performance. The grain in every instance was a very good sample, even in districts where other varieties were pinched, which demonstrates that it is not susceptible to damage by rust. Canberra has now been tested for four years on the experiment plots, and has proved its superiority over all other early maturers as a grain producer. It can be recommended to be grown in preference to Bunyip, which it has easily outyielded in every instance where the two varieties have been grown together during the past four years. It matures a shade later than Bunyip, and is just as weak in the straw, but the straw is not so brittle as that of Bunyip. It is important that Canberra should not be sown until the latter portion of the sowing season, otherwise there is a tendency for it to lodge.

Wheat Experiments at West Wyalong.

Warden (early sowing), 27 bushels 25 lb. per acre.

Improved Steinwedel prefers a drier season. It supplies the need for an early-maturing dual-purpose variety, and for early hay it is one of the best.

Hard Federation was tested in the late sowings in six districts, in three of which it yielded better than Federation, but the average of all its yields did not equal the average yield of Federation in the same districts. Three years comparative tests with the two varieties indicates that for early or mid-season sowing Hard Federation cannot compete as a grain producer with Federation, nor is it as safe a crop owing to its weaker straw. Its chief recommendation is the fine quality of its grain.

Clarendon is a new variety which matures about the same season as Hard Federation. It was tested in three districts and returned fair yields, but its chief quality appears to be its strength of straw, for it stood up better than any other early-maturing variety. It carries its head erect, which facilitates stripping, but also allows rain to enter the ear, and in consequence the grain becomes bleached.

There was only one test of *Cedar,* and that was at West Wyalong, where it returned the highest yield of the late sowing. Unfortunately, this strong red variety is very tough to strip. *Bomen* was top-yielder of the late sowing at Tubbul. The other early-maturing varieties tested were Bunyip, Florence, King's Early, Comeback, and Firbank, but they were all outyielded by Canberra.

The varieties which have given the best results this season are Bomen, Major, Yandilla King, Currawa, Marshall's No. 3, and Federation for early and mid-season sowing, and Canberra for late sowing.

Fallowing Tests.

In four districts one plot was left unfallowed, in order that the yield of the crop grown thereon might be compared with that produced on fallowed land. Unfortunately, a large proportion of the seed sown on the unfallowed plot in two of the districts, viz., Walla Walla and Henty, was destroyed by mice, and as a fair comparison could not be made with the yield of the fallowed plots, the yields are not published. It was the general experience that seed sown on fallowed land did not suffer nearly so severely from the depredations of mice as that on unfallowed land, doubtless owing to the fallowed seed-bed being better compacted.

It was the intention that the unfallowed plot should be ploughed as soon as the land was in suitable condition for ploughing after 1st March. At Milbrulong, however, the unfallowed plot was ploughed during the first week in February; even so, there was an increase of 89 per cent. in the yield on the fallow. Owing to a dry spell, the unfallowed plot was too hard to be ploughed satisfactorily up to the time of the early sowing, and it was not until just before the time of the late sowing that the land was in a suitable condition to plough. A comparison of the yield from the fallowed land sown at the same time and under the same conditions shows that a 45 per cent. increase in the yield was obtained as the result of fallowing. The early-sown plot on fallowed land yielded 31 bus. 17 lb., and for the purpose of proving the benefits of fallowing, it would be quite fair that this yield should be compared with the yield of the unfallowed plot sown later, for it was on account of the land being fallowed that it could be sown early. Such a comparison shows an increased yield of 77 per cent. in favour of fallowing.

TABLE IV.—Showing Results of Fallowing Tests.

Locality.	Variety.	Yield per acre.	
		Fallowed.	Unfallowed.
		bus. lb.	bus. lb.
Milbrulong	Federation ...	24 17	12 49
Ungarie	,, ...	25 43	17 38

The results support the deductions from the previous season's tests—that even in years of abnormally heavy rainfall the yields may be increased by the adoption of a proper system of fallowing. The increases this season are even more striking than those of the previous year.

Acclimatised *versus* Introduced Seed.

Tests were conducted in four districts to compare the results of seed introduced by the Department (which had been produced at Bathurst Experiment Farm) with seed that had been acclimatised to the district. The latter was the product of seed that had been introduced on the experiment plots one to three years previously, and that had since been carefully graded and grown in the district.

TABLE V.—Acclimatised *versus* Introduced Seed.

Locality.	Variety.	Yield per acre.	
		Acclimatised Seed.	Introduced Seed.
		bus. lb.	bus. lb.
West Wyalong ...	Federation ...	32 18	32 58
Deniliquin	,, ...	36 49	37 40
Young	,, ...	10 10	10 55
Walla Walla... ...	,, ...	22 55	20 40

There was a slight increase in the yield from the introduced seed in every district but Walla Walla, where the germination of the introduced seed was not very satisfactory. The abnormal season no doubt interfered with the value of this test. It has been the experience in more normal seasons that increased yields have been obtained in the drier districts from acclimatised seed.

Early *versus* Late Sowing.

This test was carried out with the mid-season variety Federation, early and late sowings being made in nine localities, but in every instance the sowings were made within the normal sowing season of the particular district.

TABLE VI.—Early *versus* Late Sowing.

Locality.	Early Sowing.		Late Sowing.	
	Date of Sowing.	Yield per acre.	Date of Sowing.	Yield per acre.
	1917.	bus. lb.	1917.	bus. lb.
Grong Grong ...	24 April ...	29 27	30 May ...	33 29
West Wyalong...	25 ,, ...	32 58	24 ,, ...	31 26
Milbrulong ...	7 May ...	24 17	5 June ...	24 5
Marsden... ..	27 April ...	25 42	25 May ...	25 19
Ungarie	26 ,, ...	31 17	26 ,, ..	25 43
Young	4 May ...	15 28	21 June ...	10 55
Balldale	8 ,, ...	20 44	23 ,, ...	21 3
Tubbul	2 ,, ...	20 17*	6 ,, ...	22 13
Henty	11 ,, ...	10 47	19 ,, ...	8 41
Average		23 26	.. ..	22 32

* This crop was so badly damaged by windstorms that the total yield was not recovered.

Although the season with its mild winter and spring rains was favourable for late-sown crops, yet the average of the yields of the early-sown crops is nearly 1 bushel better than the average of the others.

Rate of Seeding Tests.

In order to determine the best quantity of seed to sow per acre, three plots were sown at various rates of seeding—light, medium, and heavy—in five different districts. The quantity of seed used for the medium seeding was what is considered a fair standard for the district, according to the time of sowing. The light and heavy seedings were 12 lb. below and 12 lb. above the standard respectively, or as near thereto as the drill could be set to sow.

TABLE VII.—Rate of Seeding Tests.

Locality.	Variety.	Date of Sowing.	Light Seeding.		Medium Seeding.		Heavy Seeding.	
			Seed per acre.	Yield per acre.	Seed per acre.	Yield per acre.	Seed per acre.	Yield per acre.
			lb.	bus. lb.	lb.	bus. lb.	lb.	bus. lb.
Marsden ..	Federation ..	27 April..	33	21 48	45	25 42	57	25 48
Ungarie ..	,, ..	26 ,, ..	34	27 20	46	31 17	58	32 12
Beckom ..	,, ..	30 ,, ..	38	21 33	50	21 55	62	23 0
Balldale ..	,, ..	8 May ..	40	19 11	52	20 44	64	20 52
Berrigan ..	,, ..	18 ,, ..	38	17 28	50	18 19	62	19 45
	Average..	..	....	21 28	....	23 35	....	24 19

In every instance the highest yield was returned by the heavily-seeded plot, and the average increases of 2 bus. 7 lb. and 2 bus. 51 lb. returned by the medium and heavy seedings respectively over the light seedings is greater than in previous years. This is attributed to the destruction of seed and seedlings by mice, which considerably reduced the stands.

Manurial Experiments.

In all districts tests were carried out to determine the best quantity of superphosphate to apply to wheat. At each centre for this purpose four plots were sown, one being unmanured and the remainder receiving varying applications of superphosphate.

TABLE VIII.—Manurial Experiments.

Locality.	Variety.	No Manure.	28 lb. Superphosphate per acre.	42 lb. Superphosphate per acre.	56 lb. Superphosphate per acre.	70 lb. Superphosphate per acre.	84 lb. Superphosphate per acre.
		bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.
Grong Grong ...	Federation ...	27 38	...	32 17	33 29	33 45	...
West Wyalong .	,, ..	25 7	...	...	31 26	34 3	33 15
Deniliquin ...	,, ...	28 29	...	36 36	37 40	37 15	...
Milbrulong ...	,, ...	16 32	...	22 1	24 17	26 4	...
Marsden ..	,, ...	18 33	21 43	25 42	24 33	...	...
Ungarie ...	,, ...	23 53	28 12	31 17	30 51	...	...
Young* ...	,, ...	11 47	...	15 0	15 28	15 12	...
Beckom ...	,, ..	15 57	...	21 47	21 55	24 3	...
Balldale ...	,, ...	16 52	...	19 56	20 44	21 3	...
Walla Walla ..	Yandilla King.	8 53	...	18 13	19 43	16 29	...
Tubbul † ...	Federation ...	15 28	18 21	20 17	20 37	22 7	...
Berrigan ...	,, ...	19 13	...	20 35	18 19	19 39	...
Henty	Yandilla King.	11 33	...	11 49	13 0	13 5	...
Average		18 27	...	...	24 0	...	...
Percentage increase... ...		..	...	...	30	...	...

* These crops were severely cut by hailstorms.
† These crops were badly damaged by windstorms.

TABLE IX.—Showing Increase per acre attributable to Manure.

Locality.	28 lb. Superphosphate per acre.	42 lb. Superphosphate per acre.	56 lb. Superphosphate per acre.	70 lb. Superphosphate per acre	84 lb. Superphosphate per acre.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Grong Grong ...	......	4 39	5 51	6 7	......
West Wyalong ...	......	.....	6 19	8 56	8 8
Deniliquin	.....	8 7	9 11	8 46	......
Milbrulong ...	......	5 29	7 45	9 32	......
Marsden	3 10	7 9	6 0	......	......
Ungarie	4 19	7 24	6 58	......	......
Young	......	3 13	3 41	3 25	......
Beckom	......	5 50	5 58	8 6	......
Balldale	.. ...	3 4	3 52	4 11	... ..
Walla Walla ...	......	9 20	10 50	7 36	......
Tubbul	2 53	4 49	5 9	6 39	......
Berrigan	......	1 22	(–) 0 54	(–) 0 26	......
Henty	......	0 16	1 27	1 32	......
Average ...	3 27	5 3	5 33	5 56	.... .

(–) Signifies decrease.

TABLE X.—Showing Value of Increase, less Cost of Manure.

Wheat valued at 3s. 6d. per bushel ; Superphosphate valued at 5s. per cwt.

Locality.	28 lb. Superphosphate per acre.	42 lb. Superphosphate per acre.	56 lb. Superphosphate per acre.	70 lb. Superphosphate per acre.	84 lb. Superphosphate per acre.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Grong Grong ...	......	0 14 4	0 17 11	0 18 3	......
West Wyalong ..	......	.. ...	0 19 7	1 8 1	1 4 8
Deniliquin ...	......	1 6 6	1 9 7	1 7 6	......
Milbrulong ...	......	0 17 3	1 4 7	1 10 2	......
Marsden	0 9 9	1 3 1	0 18 6	.. ...	......
Ungarie	0 13 10	1 4 0	1 1 10	......	......
Young	......	0 9 4	0 10 4	0 8 9	......
Beckom	......	0 18 6	0 18 4	1 5 2	......
Balldale	.....	0 8 10	0 11 0	0 11 6	.....
Walla Walla ...	... ..	1 10 9	1 15 4	1 3 5	......
Tubbul	0 8 10	0 14 11	0 15 6	1 0 1	......
Berrigan	......	0 2 10	(–) 0 5 7	(–) 0 1 7	......
Henty	......	(–) 0 0 11	0 2 6	0 2 2	......
Average ...	0 10 9	0 15 9	0 16 10	0 17 7	......

(–) Signifies loss.

At Henty and Berrigan the tests were not satisfactory, owing to water lodging and interfering with the growth of the crops. In all other districts the results from manuring have been most marked. At Ungarie and Marsden 42 lb. superphosphate per acre returned the highest yields ; this has been the experience with previous tests in these two districts. In the remaining districts 56 lb. superphosphate per acre gave an increased yield over 42 lb., and in eight out of eleven tests a further increase in the yield resulted from the increase in the quantity of the same fertiliser to 70 lb. per acre.

The average increase per acre as the result of applying 56 lb. superphosphate per acre is 5 bus. 33 lb., or 30 per cent. increase over the unmanured plot. This is the highest increase obtained in these tests for the past six years ; usually the increase is about 25 per cent. For the application of 70 lb. there is a further average increase to 33 per cent. over the unmanured plot.

Table X gives the net profit over the cost of the manure. The 70 lb. application has proved the most profitable in six out of eleven tests, and has returned the highest average profit—17s. 7d. per acre. In six districts the profit was over £1 per acre.

Crop-harrowing Tests.

To determine whether the practice of harrowing a growing crop is beneficial, two plots of Federation were sown under exactly similar conditions, and one crop was harrowed and the other left untouched. The test was made in three districts.

Some difficulty was experienced in conducting this test, owing to the saturated condition of the soil throughout the late winter and early spring. Under these conditions, it is remarkable that the harrowing should show any advantage, yet increased yields of 7 per cent. and 5 per cent. were obtained at Deniliquin and Milbrulong respectively. At Berrigan the test was scarcely a fair one, owing to the depredations of mice and the lodgment of water.

TABLE XI.—Crop-harrowing Tests.

Locality.	Variety.	Date of Harrowing Crop.	Yield per acre			
			Crop Harrowed.		Crop Not Harrowed.	
			bus.	lb.	bus.	lb.
Deniliquin ...	Federation ...	End June ...	37	40	34	47
Milbrulong ...	,, ...	13 September	24	17	23	0
Berrigan ...	,, ..	31 August ...	17	37	18	19

Oat Trial.

A trial with oats crops was carried out at Young, on the property of Mr. H. G. M. Thackeray. The plots were sown on 4th May, at the rate of 40 lb. per acre, with the exception of Sunrise, which was sown on 21st June at the rate of 53 lb. per acre. The land was fallowed, and received the same cultivation as for the wheat experiments at this centre.

The yields per acre were as follows :—

	bus.	lb.		bus.	lb.
Algerian ...	45	24	Guyra ...	39	25
Ruakura ...	41	28	Lachlan ...	35	35
Brown Calcutta	40	29	Sunrise ...	22	19

Mice destroyed a considerable proportion of the seed of Sunrise, which was sown late, and in consequence the stand was extremely thin.

North-western District.

R. W. McDIARMID, Inspector of Agriculture.

THE wheat experiments conducted by the Department during the past season were located on the farms of the undermentioned :—

W. Palmer, "Pine View," Narrabri.
J. J. Carroll, "Oak View," Narrabri.
G. W. Grahame, "Belah Park," Wee Waa.
A. E. Philp, "Eularoi," Bellata.
J. T. Maunder, "The Wilgas," Pallamallawa.
R. A. Warden, Mt. Russell.
J. Perry, "Killara," Quirindi.
Y. C. Ormiston, "Glenfenzie," Gunnedah.
A. E. Weakley, "Pine View," Currabubula.
Wm. Lennox, "Claremont," Baan Baa.
A. H. McGowan, Bective, Tamworth.
J. E. O'Grady, Nemingha, Tamworth.
E. Currell, "Herbert Vale," Barraba.
Bignall Bros., "Arlington," Manilla.

The experiments consisted of variety and manurial trials with wheat and a few plots of oats and barley. At each centre the number of plots was ten, except at Nemingha and Gunnedah. At Nemingha the experiments were originally sown to demonstrate which varieties would stand up on the black soil that is so plentiful in that district and in the north-west generally. The season was late, and consequently the growth was not so prolific as an earlier germination would have given.

It was intended to sow the early and late maturing varieties at different times to allow each variety ideal conditions for best development, but the autumn was exceptionally dry, and all the sowings were later than is usually desirable.

The Season.

A study of the table setting out the rainfall at each centre shows the summer months to have been very wet, and to have been followed by a very dry autumn, winter, and spring. These conditions gave a very prolific growth of weeds, thistles, &c., throughout the north-west, necessitating mowing and burning before the land could be prepared for the wheat experiments. These operations delayed ploughing, whilst the harvesting operations conducted during a very wet period caused the land to set hard; consequently, most farmers were obliged to wait for rain before they could plough and it was not until June that they could complete that part of their preparation. The north-west soils generally are not adapted for holding surplus moisture, being devoid of a clay subsoil, and those farmers who prepared the land early did not get a germination until the weather changed about the middle of June.

TABLE showing Rainfall during 1917.

District.	Yearly Average.	Jan.	Feb.	Mar.	Apl.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
	inches.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	inches.
Bective	27·32	719	86	42	23	36	276	100	168	443	142	714	174	..
Nemingha	27 32	516	191	31	19	21	212	124	158	449	218	681	176	..
Manilla	26·19	675	162	41	15	12	189	83	91	483	256	616	262	28 85
Barraba	..	336	348	46	32	..	176	171	130	554	199	766	412	30·70
Mt. Russell	..	719	315	97	5	25	106	89	136	557	137	1029	400	..
Pallamallawa	..	424	215	92	20	..	105	43	51	509	160	650	136	..
Gunnedah	24·98	621	131	30	..	10	210	79	192	300	181	395	270	..
Currabubula	..	499	103	72	6	..	213	73	201	432	281	418	338	26·46
Narrabri	26·25	531	100	..	..	3	234	59	112	355	151	528	?	..
Quirindi	27·62	..	..	..	..	..	..	..	..	..	..	..	..	..

The lateness of the sowing, and the dry months of July and August, hastened the early varieties to maturity before they had time to stool out or attain any height. The late-maturing varieties, which in average years would have been a total failure, responded magnificently to these late rains, and consequently surpassed in yield the early varieties in almost every instance. In some cases the seed was sown in a dry seed-bed, and where the mice were plentiful the germination was extremely thin. This was the case particularly at Pallamallawa, Bellata, Wee Waa, Narrabri, and Gunnedah. The season was not so conducive to rust as the previous one, and only occasional areas were affected to any extent.

The plots at Quirindi were the last sown, yet they made the heaviest growth of any, and became so completely tangled and lodged early in November that it was impossible to harvest any grain. In this district the heaviest yields in the north-west were obtained, ranging up to sixteen bags per acre, and land that usually failed through lack of summer moisture produced high yields.

Cultural Notes.

Narrabri.—At Mr. W. Palmer's farm the land was rather sandy. It was disc-ploughed about the middle of January, and again at the end of April. At sowing time, 16th May, there was moisture underneath, but too low down to germinate the seed, which was drilled in at the rate of 50 lb. per acre without manure. The previous crop was wheat, also without manure. The seed germinated unevenly and thinly, so the plots were fed off lightly with sheep in July. With the following dry weather the growth was very short and thin, and the yields light. The plots were harvested on 10th November.

At Mr. J. J. Carroll's farm the land was mostly new; it was ploughed in October with the mouldboard plough and again disc-ploughed in April; harrowed on 1st May, and seed drilled in on 2nd May, using 50 lb. per acre without manure. The seed germinated thinly after the June rains, and growth was very light and short. The samples of grain were all good, the damage from rust being very slight.

Wee Waa.—The land here was rather heavy and inclined to dry quickly. It was ploughed 4 inches deep in February, after a crop of wheat (not fertilised) had been taken off the previous month. The spring-tooth cultivator was used on 5th May, and the harrows on 21st May. Sowing was done on 25th May, using 50 lb. of seed per acre without fertiliser. The germination was thin, and subsequent growth very short until flowering time, when the weather improved. Storms and wind were responsible for a good deal of loss prior to harvesting.

Bective.—In this case the land had been cropped the previous year without any fertiliser. It was ploughed in February, disc-cultivated in May, and harrowed three times to break the lumps. The seed was sown in dry land, and mice destroyed much of the grain before germination. The growth of straw was heavy here, and some was damaged by wind and rain. Take-all was present in the plot of Hard Federation. The samples of grain were mostly good, though bleached, and Federation was pinched by rust.

Nemingha.—The land here had been cropped for two years and then spelled for twelve months. It was disc-ploughed early in March, harrowed and the rubbish burned off, and then cross-ploughed in May. The seed was drilled in on 15th June, after the rain had fallen. The germination was good and the early growth satisfactory. The late rains produced a heavy growth in each plot, but not sufficient to cause much lodging. Major stood up better than any other variety, and was followed closely by Cleveland, Currawa, Hard

Federation, and Bomen. Yandilla King was the worst, owing to the presence of rust. The samples of grain were all good, that of Cleveland being perfect. The plots were harvested on 21st December.

Manilla.—The experiment plots were located on the same land as in the previous year, and were sown without fertiliser. The land was ploughed at the end of February and again in May, with several harrowings to break down the lumps. The seed was sown in dry soil on 31st May, and much was destroyed by mice, the result being a very thin germination. The crops were very light, and Canberra, Federation, Hard Federation, and Bunyip were too thin to harvest.

Barraba.—The paddock was cropped the previous year with Marshall's No. 3, the straw of which was burned off. The land was then disc-ploughed early in March, and twice disc-harrowed previous to sowing on 29th May. The seed was planted in dry land, and mice again caused a thin germination. During harvesting operations severe storms completely lodged most of the plots, and only portion from each could be gathered. Cleveland promised 12 bags per acre prior to these storms.

Mt. Russell.—The land originally selected was not utilised at sowing time, owing to the presence of much unshot grain from the previous harvest. Maize was harvested for grain in May from the land chosen; it was mouldboard ploughed early in June, harrowed, drilled and harrowed. The soil was moist, and the seed germinated at once satisfactorily. The subsequent growth was heavy. Rymer, Warden, and Yandilla King lodged badly, while Bomen, Genoa, Florence, and Cleveland stood up best.

Pallamallawa.—Wheat was grown on the land utilised for the plots the previous year. The stubble was burned, then the land was ploughed at the end of May, harrowed, drilled, and harrowed again after sowing. All varieties were thin after germination, the worst being Florence and Bunyip, the best Bomen, Comeback, and Marshall's No. 3. Rust affected some, but the season generally was too dry until too late in the season. The plots were harvested on 27th December.

Quirindi.—The land here was rich alluvial soil fronting the creek. The previous crop was wheat in 1916, which lodged and was flooded, so could not be harvested. The land was ploughed in May, and harrowed after the first rain in June to germinate the old wheat; it was then cultivated and harrowed on 23rd June and drilled on 25th June. The germination was splendid and the early growth very rapid. The varieties all grew very tall, being 5 feet high by the end of September. The heavy rain during November and December, together with the winds, caused such complete lodging that it was impossible to do anything with the crop.

Currabubula.—The land here was light loamy soil, and had carried a crop of wheat the previous year without any fertiliser. It was ploughed early in March, spring-tooth cultivated early in June, and harrowed just prior to drilling on 21st June. The germination was good and the growth fair, but the spring months were too dry. The plots were harvested on 19th December.

Baan Baa.—The soil here was a light sandy loam, which had been cropped the previous year with wheat. It was disc-ploughed early in May, harrowed after the first rain in June, drilled on 23rd June. The germination was good and growth satisfactory, the season being too dry for best growth. Harvesting was done on 3rd January.

Bellata.—The land here is rather heavy and very rich. It was cropped with Warren wheat the previous year. Ploughing was done with a mouldboard plough in May, and again worked in the middle of June. The seed was drilled in on 19th June, using 50 lb. of seed per acre. The germination was rather thin throughout, and the dry spring on top of the late sowing produced a very light growth throughout. Harvesting was done on 12th December.

Gunnedah.—The land here is light red soil, and rather stony in places. It had been cropped the previous year, and the stubble burned. Ploughing was done early in May; during the month the land was harrowed, and the seed was drilled in on 28th May. The germination was thin and growth very light. Mice apparently ate much of the seed after sowing, for germination did not take place until late in June. The plots were harvested in the second week of December.

The Variety Trials.

Variety trials were conducted at each centre, *Federation* being used as a check, excepting at Nemingha, where *Hard Federation* was used. Of these two varieties, the new strain appears to be the more suitable for the north-western districts, although in most plots this year the old variety was on top. Last year Hard Federation was the heavier yielder in every instance.

Varieties very strong in the straw, rust-resisting, and good yielding are essential for the north-west, and apparently the early maturing or very late maturing varieties are more suitable for the prevailing weather and soil conditions than the mid-season varieties.

Bomen, *Cleveland*, and *Major* were the outstanding varieties this year, and are likely to be extensively grown in the cooler portions of the district.

Of the early-maturing varieties, *Canberra* has been the most successful, having surpassed Florence in every case, and Bunyip in all except one. It is essential, though, to sow it only on the light soils.

Comeback gave light yields only, but was top in one instance, this being in all probability due to better germination.

Cleveland was sown in the cooler portions of the district at four centres, and gave the highest yield at each of the three where harvested. It was particularly clean and stood up well, except at Quirindi.

Currawa was sown at two places only, and was well up on the list at each when harvested. It does not stand so well as Major, but appears to be very suitable for the north-west and is deserving of more attention.

Genoa is a late variety, but it did not yield very well, being low down on the list at each place excepting at Mt. Russell.

Major is the strongest strawed variety of all under trial; it is late maturing and heavy yielding as a rule. It should be very suitable for the cooler districts, and where the soil is heavy and rich. The failure at Manilla was evidently due to faulty germination.

Penny was tested at two centres only, but did not distinguish itself.

Roseworthy was likewise tested at two centres, but was not very promising.

Of the older varieties, *Yandilla King* was the most successful, and it surpassed Federation in most cases where both were sown.

TABLE showing Results of Variety Trials, North-western District, 1917.

Variety.	Palmer, Narrabri.	Carroll, Narrabri.	Wee Waa.	Bective.	Nemingha.	Manilla.	Barraba.	Mt. Russell.	Pallamallawa.	Gunnedah.	Currabubula.	Baan Baa.	Bellata.
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb	b. lb.	b. lb.
Bomen	9 34	..	..	14 15	24 32	3 44	..	24 12	11 0	..	10 29	17 45	..
Bunyip	12 58	9 53	8 27	..	..	..	..	..	6 4	1 0	..	12 0	5 36
Canberra	15 14	5 50	14 6	..	..	..	1 24	..	6 26	1 30	10 0	17 21	10 6
Comeback ..	8 57	8 12	10 48	..	..	..	..	..	11 50	..	..	10 32	7 0
Cleveland	..	..	..	..	27 48	..	23 20	26 33	..	..	..	..	..
Currawa .. .	..	..	9 40	..	21 45	..	..	..	..	..	..	..	..
Florence	11 58	5 7	6 12	9 12	..	9 9	2 51	23 6	3 12	5 30	6 33	16 34	4 46
Genoa	..	..	..	12 57	..	7 13	..	24 0	5 10	..	..	..	..
Federation ..	10 50	14 10	11 27	17 44	..	..	3 33	24 32	4 52	6 30	8 35	16 38	12 3
Hard Federation ..	12 50	11 30	8 21	11 54	20 51	..	4 45	23 26	4 12	6 0	4 46	17 1	7 31
King's Early ..	..	..	10 50	..	..	..	..	..	..	..	..	16 1	7 42
Marshall's No. 3 .	..	..	..	..	..	..	16 30	..	9 30	7 30	9 0	..	..
Major	..	..	..	18 50	25 46	4 38	..	..	..	..	..	..	..
Penny	..	..	..	..	..	..	..	..	5 0	..	..	..	..
Rymer	..	..	..	12 18	..	3 20	11 56	17 34	.	..	11 5	..	..
Roseworthy ..	..	12 10	..	13 55	..	..	..	..	..	..	..	..	.
Steinwedel ..	..	..	9 32	..	..	..	..	..	..	..	..	..	8 27
Sunset	9 4	15 20	..	..	..	..	..	..	..	..	..	..	3 40
Warden	..	..	..	17 37	..	..	9 42	15 0	..	..	..	..	..
Warren	11 30	11 16	6 5	..	..	..	6 35	..	..	..	..	16 57	5 31
Yandilla King ..	12 14	..	..	15 7	19 2	9 12	16 33	19 35	..	..	9 58	18 42	..

Fertiliser Trials.

Small comparative sowings were made at Narrabri and Currabubula to ascertain the value of superphosphate when sown with an early-maturing variety of wheat. Other sowings were also arranged for, but unfortunately the seed was destroyed by mice prior to sowing. The following results were obtained:—

Variety.	Manure.	Narrabri.	Currabubula.
		bus. lb.	bus. lb.
Florence ...	Nil	11 58	......
,, ...	30 lb. Superphosphate per acre...	12 10	......
,, ...	30 lb. N.S.W. Phosphate ...	11 30	......
Canberra ...	Nil	......	10 0
,, ...	30 lb. Superphosphate	......	10 15

The year was very unsuitable, but the use of the superphosphate in each case has shown a slight increase. In the only trial of New South Wales phosphate a decrease of about half a bushel per acre was recorded.

Oat Trial.

In conjunction with the wheat plots at Mt. Russell, two plots of oats were sown—one brown and one white variety. The growth was very heavy, and each variety lodged rather badly. The seed was sown on 22nd June, at the rate of 50 lb. per acre, without manure. The greater portion of the plots was harvested with the following results:—

Algerian	32 bushels 36 lb.	per acre.
Abundance ...	39 „ 4	„

The Abundance variety, like most white oats, is rather too coarse in the straw and is liable to lodge.

General Conclusions.

The season was most unsuitable for wheat in the major portion of the north-west, and the results obtained from the experiments are therefore not of great value for the purposes of general practice. The season was extremely dry during the autumn, causing late sowing, and likewise dry during the winter and spring months. Germination at the different centres was generally thinner than is desirable. Feeding off, which is so generally practised, was out of the question. Crops were mostly short and thin, excepting in the more favoured districts of Quirindi, Tamworth, and Inverell. The results, however, seem to be somewhat in accordance with previous years' experience with regard to the varieties, the very early and very late maturing ones being better yielders than the mid-season ones. The varieties possessing the qualities most desired in the north-west apparently are Major, Currawa, Bomen, and Cleveland. Federation and Hard Federation are too susceptible to rust, and most of the other varieties are liable to lodge under conditions favouring excessive growth and weakness in straw, and the effects of rust.

Wheat and Oats for Hay.

Hay trials were conducted by the following farmers, who in this co-operated with the Department:—

J. F. Chick, Tenterfield.
J. T. Elliot, Armidale.
L. M. Rixon, Uralla.
Mitchell and Ross, Ravensworth.

At Tenterfield the seed was sown on 7th July, using 100 lb. of seed and 1 cwt. of superphosphate, broadcasted, per acre. The following yields of hay per acre were harvested on 10th December, the samples of hay in each instance being very good, especially Warden, Bomen, and Cleveland. Rust attacked Roseworthy and Genoa first, but did not develop before cutting.

	tons	cwt.	qrs.	
Bomen	1	17	0	per acre.
Warden	1	17	0	„
Cleveland	1	10	0	„
Genoa	1	7	0	„
Roseworthy	1	5	0	„

At Uralla, oats and wheat varieties were under trial, and a manurial trial with oats was also conducted. The variety trial was sown on 5th May, without manure, and the manurial trial on 26th June. In the variety trial the growth was very heavy and tangled, Florence wheat and Sunrise oats standing up best. The following yields per acre were harvested :—

	tons	cwt.	qrs.
Variety Trial—			
Ruakura oats	3	5	0
Algerian ,, ...	3	8	0
Lachlan ,, ...	4	7	0
Sunrise ,, ...	3	1	0
Florence Wheat	2	1	2
Manurial Trial—			
Guyra oats, no manure	2	1	2
,, 84 lb. Superphosphate per acre	3	12	0
,, 105 lb. P5	1	7	0
,, 147 lb. W2	2	9	0

The results show a very marked increase from the use of superphosphate, while the application of P5 was attended with a reduction, and that of W2 with only a small increase. The composition of P5 is superphosphate 16 cwt. and sulphate of potash 4 cwt., and of W2 superphosphate 6 cwt., sulphate of ammonia 3 cwt., and sulphate of potash 1½ cwt.

At Armidale the plots were sown on black soil on 22nd May, using 100 lb. of seed and no manure per acre. The germination was poor, and young growth was very slow owing to the extremely dry and severe winter. The plots had to be utilised to save starving sheep—ewes and lambs—consequently no growth was obtained for hay.

At Ravensworth the plots were sown on 22nd May for green feed, but they were not required for that purpose, and were allowed to mature for hay. The seed was drilled in at the rate of 1 bushel per acre without manure. The following yields per acre were harvested :—

	tons	cwt.	
Algerian oats	1	15	per acre.
Ruakura ,, ...	1	10	,,
Sunrise ,, ...	1	18	,,
Lachlan ,, ...	1	12	,,
Guyra ,, ...	1	12	,,
Huguenot wheat	2	0	,,
Thew ,, ...	1	10	,,
Florence ,, ...	1	8	,,

The plots experienced a very dry period from sowing until near the end of October, when the weather conditions improved and they made a wonderful recovery; in fact, from being apparently a complete failure they became a satisfactory crop.

Wheats for Hay at Yanco.

J. M. PITT, Experimentalist.

[The Experiments Supervision Committee, under whose control these experiments ar being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for a few years. Later, when results for, say, five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.]

AN experiment with wheat was carried out at the Yanco Experiment Farm on lines similar to those of previous years, viz., an early, mid-season, and late sowing of a number of varieties, the object being to determine the most suitable variety for hay, and at the same time to ascertain which is the most suitable time to sow to obtain the maximum yield from the individual varieties under irrigation.

Considering that dairying is an important industry on the Area, and that wheats for hay or green fodder should play an important part in its success, an experiment carried out on such lines would supply information of more value than one, say, for grain, especially where the areas are small; and judging by inquiries made at different times, this seems to be the case. Owing to the variable seasons, though, accurate data cannot be looked for until trials extending over a number of years have been undertaken. As an instance of the important part the season plays, take for example :—early-sown Florence and Firbank in 1916 were sown on 13th April, and showed their first ears on 28th August, whilst this year, sown a week earlier, the first ears were noticed before the end of July. Although the rainfall over both periods was practically the same, the temperature on the whole was warmer this year, thus probably forcing the plants into head earlier.

The only alteration in last year's list was the replacing of Rymer with Cleveland, and the latter quite justified its inclusion. Zealand, which can almost be termed the standard hay variety of the western Riverina, was again used for checks.

Although the growth in a number of the plots was higher than that of last year, still the weights were not nearly as heavy. This may be accounted for, first, by mice removing a fair amount of the seed after sowing; secondly, by rust being more prevalent; and lastly, by lodging taking place to a greater extent, it being found almost impossible to get a proper cutting on some of the plots.

The Season.

Like the preceding year, the growing and harvesting period was remarkable for the amount of rainfall—1,882 points falling from the time of the first sowing until harvesting was completed—rain falling on 86 of the 239 days, or on one in less than every three.

Only one irrigation was necessary, and that to ensure a moist seed-bed for the early sowing. So, from an "under irrigation" point of view, the experiment is valueless.

It was the original intention to make the sowings at intervals of a month from the first, but rain falling immediately prior to the mid-season and again before the late-sown, prevented the arrangement being carried out; in fact, the late sowing was put in under conditions anything but ideal, and the yields in consequence were light. All the plots, excepting a few of this sowing, germinated splendidly, the earlier sowings helped by showers soon making rapid growth. The late-sown, unfortunately, did not fare so well, the cold wet weather retarding growth until late in the season.

As was only to be expected, the plots were badly attacked by rust, the early-sown suffering most. Cleveland, by the way, stood out conspicuously in all three plots as being least affected. It was noticeable, too, that frosts in June and early August played havoc with Florence and Firbank, grain practically being a negligible quantity.

Early in October heavy rain and gales caused a good deal of lodging, and as some of the varieties had reached a height of over 6 feet, considerable difficulty was found in harvesting. Some of the early-maturing varieties of the early sowing, too, had gone past their best, but in seasons where rains extend well into the spring, this will nearly always be the case.

Behaviour of Varieties.

Zealand.—On the whole, this variety again showed its superiority. The early plots in particular were badly rusted, the hay suffering considerably. One or two plots of the mid-season sowing looked very fine before lodging took place.

Yandilla King.—This variety did very well this season, the mid-season plot in particular turning out exceptionally well—returning 1 ton off a third of an acre. Rust was prevalent on the early-sown in fairly large quantities, and also the later sowings to a lesser degree.

Marshall's No. 3.—Yielded fairly well in all three sections, the late sowing showing up to the best advantage. This variety again showed its inability to withstand strong wind, the early-sown plot lodging badly. A good deal of rust was present.

Cleveland, although faring badly in the early growing stages, showed up remarkably well after the warmer weather set in, the mid-season plot being very fine and even. As before mentioned, rust was almost entirely absent, and another feature worth mentioning is that lodging did not take place to any extent. It matures later than Yandilla King and Marshall's No. 3.

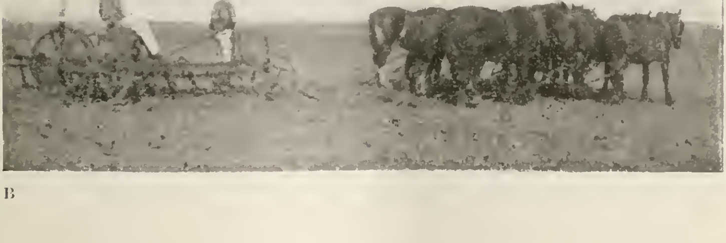
Florence.—This variety did not do too well in any of the sowings this season. In the early-sown it matured too early, breaking into head before it was 3 feet high, and was then caught by frost. In the mid-season the excessive rain made the growth weak and spindly; and the late plot had no chance owing to water lodging. Rust was present.

Firbank.—The season was also unsuitable for this variety. The early-sown matured too early, and suffered the same fate as Florence. The mid-season turned out the most satisfactory. Rust was noticeable.

Steinwedel.—The seed of this variety arrived too late for the early sowing. The best results were obtained in the late-sown plot; but taken all round, the figures are not as good as last season.

TABLE showing Results of Wheat for Hay, Yanco Experiment Farm, 1917.

Plot.	Variety.	Acre Yield.				Percentage Yield.	Remarks.
		t.	c.	q.	lb.		
	Early Sowing, 3rd April, 1917.						
1 (*check*) ..	Zealand	2	7	3	7	100·	Lodged badly.
2 ...	Yandilla King ...	2	8	0	9	99·2	Stood up well.
3 .	Cleveland ..	2	8	1	8	92·9	,, ,,
4 (*check*) ...	Zealand	2	9	3	2	100·	Lodged in patches.
5 ...	Marshall's No. 3...	2	5	0	21	93·	Lodged very badly.
6 (*check*) ...	Zealand	2	7	1	15	100·	Cut badly.
7 .	Florence	1	17	0	17	77·3	Past its best when cut.
8 ...	Firbank	1	16	2	13	75·2	,, ,,
9 (*check*) ...	Zealand	2	9	1	10	100·	Lodged in patches.
	Mid-season Sowing, 17th May, 1917.						
10 (*check*) ...	Zealand	2	13	3	4	100·	Good.
11 ...	Yandilla King ...	3	0	0	0	113·3	,,
12 ..	Cleveland... ..	2	15	2	3	106·5	,,
13 ...	Marshall's No. 3...	2	7	3	4	93·1	Lodged badly.
14 (*check*) ...	Zealand	2	10	1	24	100·	,, in patches.
15 ...	Steinwedel ...	1	11	2	27	60·3	
16 ...	Florence	2	1	2	2	75·9	
17 ...	Firbank	2	3	2	6	76·7	
18 (*check*) ...	Zealand	2	18	3	8	100·	Very good.
	Late Sowing, 22nd June, 1917.						
19 (*check*) ...	Zealand	1	10	2	22	100·	
20 ...	Yandilla King ...	1	10	0	18	97·7	
21 ..	Cleveland... ..	1	9	1	27	95·0	
22 (*check*) ...	Zealand	1	11	0	20	100·	
23 ...	Marshall's No. 3 ..	1	12	3	7	110·7	
24 ...	Steinwedel ...	1	11	0	8	94·4	
25 (*check*) ...	Zealand	1	13	3	0	100·	
26 ...	Florence	1	3	2	8	68·3	Partly spoilt by water.
27 ...	Firbank	1	6	3	19	76·4	
28 (*check*) ...	Zealand	1	15	3	19	100·	



The Peanut.

[Continued from page 142.]

W. D. KERLE, Assistant Inspector of Agriculture, and Experimentalist,
Hawkesbury Agricultural College.

Rotation Systems.

A PROPER system of rotation should be followed with peanuts as with other crops. To retain the soil fertility—which is dependent on so many factors—unimpaired, it is necessary to follow a rotation suited to the soil and climatic conditions. The growth of any crop on the same ground for several seasons is known to result in lowered production ; it is even undesirable to include in a rotation two or more members of the same family, since the probabilities of inroads due to crop diseases are increased.

The following cropping systems are suggested for the districts concerned, the times of sowing being approximate only :—

North Coast.—In this district, where dairying, pig-raising, maize and potato-growing are the main agrarian industries, the following rotations are suggested :—

I.—1st Year, Potatoes (main crop), sown July–August.
,, Cowpeas, sown December, and ploughed in.
2nd Year, Maize (main crop), sown September.
3rd Year, Fodder Crop, sown April, fed off.
,, Peanuts (main crop), sown September–October.

This is a five-course rotation, in which a main crop of peanuts would be sown every third year. To ensure the soil being in better condition, the fodder crop (barley, wheat, &c.) could follow the potatoes, and the cowpeas could be broadcasted in the maize at the tasselling period, and ploughed in after the maize has been harvested.

II.—1st Year, Potatoes (Autumn crop), sown in February.
„ Peanuts (main crop), ,, September.
2nd Year, Fodder Crop (barley, &c.), „ May.
,, Maize (main crop), ,, September.

In this rotation it may be preferable to fallow after the peanuts to ensure favourable planting conditions for the maize. The autumn sowing of potatoes is limited to certain districts, owing to the climatic conditions at that time being favourable to the spread of Irish Blight.

III.—1st Year, Maize (main crop), sown September.
2nd Year, Peanuts, ,, „ September–October.

This is a simple two-course rotation for localities where potatoes are not profitable.

At the present time, while the market for nuts for roasting is limited they can be grown for pig-raising. For this purpose the following systems are suggested:—

IV.—1st Year, Maize (main crop), sown September.
„ Peanuts (for pigs), „ December.

The maize would be sown about September, and in the last cultivation, just before the tasselling stage, the peanuts would be sown between the rows. After the maize was harvested, the cattle would be turned in to eat the peanut tops and maize stalks, and after them pigs to unearth the nuts.

V.—1st Year, Maize (main crop), sown September.
„ Cowpeas, sown December and ploughed in.
2nd Year, Maize (main crop), sown September.
„ Peanuts, sown December and foraged by pigs.

In this system the cowpeas would be sown in the maize just prior to the tasselling period, and ploughed in about March or April. The succeeding crop of maize would be sown with peanuts and foraged by pigs in a similar manner to that in the preceding rotation.

Numerous rotations of the above kinds could be suggested to include also other crops, such as sorghum, sweet potatoes, pumpkins, turnips, &c. The farmer would be guided chiefly by the market for his crop as to which would best suit his particular requirements. It is advisable, however, only to sow the main crop of peanuts once every two or three years, and it should, if possible, follow a crop which has been kept well cultivated and free from weeds.

The Central and South Coast.—The climatic conditions of these districts somewhat militate against the peanut as a main crop. However, it is more than possible that it would be a payable proposition, judging by the yields obtained at Hawkesbury Agricultural College. The rotations to adopt might be similar to those for the North Coast district, the times of sowing being relatively later.

The Murrumbidgee Irrigation Area.—It is suggested for this district that peanuts could be successfully grown between the young fruit trees. They could be fed to pigs or harvested for the market, and in either case would be beneficial to the young orchard, particularly if the main portion of the roots, rich in nitrogen-bearing nodules, were left in the soil. They could be sown with a cereal crop in alternate years as main crop sowings.

VI.—1st Year, Sudan Grass (for soiling or hay), sown October.
2nd Year, Fodder Crop (for ensilage or feed), sown May.
„ Peanuts (main crop), sown October.
3rd Year, Fodder Crop (for ensilage, &c.), sown May.
„ Maize (main crop), sown October.

This intense rotation is suggested where dairying is practised, and it has peanuts as one of the main crops.

If the market demands bright nuts and only red soil is available, this rotation could be modified by sowing maize in October of the second year and planting peanuts between the rows just before the tasselling stage, and allowing cattle and pigs to forage the fodder as recommended above.

Manuring.

The amounts of the principal plant-food constituents required by a 60-bushel crop of peanuts, calculated from data reported by the Tennessee Experiment Station, U.S.A., are given below :—

		Lb. per acre.			
		Nitrogen.	Phosphoric Acid.	Potash.	Lime.
Peanuts with hulls ...	1,380 lb.	44·22	9·08	12·73	4·66
Peanut hay	2,000 lb.	40·49	5·72	19·57	41 64
Total weight of crop...	3,380 lb.	84·71	14·80	32·30	46·30

Although the above figures do not indicate the exact proportion of manurial constituents a fertiliser for peanuts should contain, they serve as a guide in formulating a suitable mixture of mineral fertilisers.

The power possessed by the order of plants to which the peanut belongs (*Leguminosæ*), of utilizing the free nitrogen of the atmosphere in their life processes, renders the application of nitrogenous fertilisers of little value. In soils deficient in humus it is advisable to furnish a small percentage of nitrogen, in order to supply the young plant's requirements until its vital processes are sufficiently developed to permit it to dispense with assistance.

Responding, as the peanut does, to the use of commercial fertilisers, the following formulæ are recommended for general use, and are particularly suitable for light, sandy loams :—

I.—Superphosphate	88 lb. per acre.
Sulphate of Potash	62 ,,
Dried Blood (or Sulphate of Ammonia, 15 lb.)	22 ,,

This complete fertiliser, applied at the stated amounts per acre, will cost approximately 17s. 6d., and will supply :—

Phosphoric Acid	15 lb.
Potash	32 ,,
Nitrogen	3 ,,

Bone-dust may be substituted for superphosphate in a mixture consisting of—

II.—Bone-dust	68 lb. per acre.
Sulphate of Potash	62 ,,

This would give the same amounts of phosphoric acid and potash as above, and practically the same amount of nitrogen. In most soils this quantity of nitrogen would be sufficient to give the young plants the impetus they require.

It is essential for the proper development of the peanut, that the lime-content of the soil be comparatively high. The soil need not be naturally calcareous, but it is imperative that the deficiency be made up by applications of lime in some form, since it is also necessary to a satisfactory mechanical condition of the soil, to assist in liberating unavailable plant food, and as a base for the bacteria contained in the root tubercles, whose function is the assimilation of atmospheric nitrogen. Lime is most economically applied in an air-slaked condition. Dressings of 15 to 20 cwt. should be worked into the surface soil, preferably in the autumn, at least three weeks before sowing. It should never be applied at the same time as manure or fertilisers containing nitrogen, or there will be a heavy loss of that valuable ingredient. The presence on the land of sedges, sorrel, rushes, &c., is indicative of badly drained and therefore sour land, requiring liming and artificial draining before peanuts can be sown with any measure of success.

Farmyard manure tends to produce luxuriant foliage but badly-filled pods, and unless well rotted, it may causes the ground to become infested with weeds. It is, therefore, only advisable when the soil is deficient in humus, and then it should be applied for preference with the preceding crop. The bacteria, which live in symbiotic relationship with peanuts, as with all legumes, are usually sufficiently abundant in the soil ; but if the development of nodules is meagre, it would probably be found advantageous to artificially inoculate the soil, since its ability to produce large yields must depend to a very considerable degree on the prolificacy of these rhizobia.

The Seed and Seed Selection.

The seed for the first season's crop must be obtained from a reliable source, and consist of well matured, perfect nuts, if possible acclimatised. For subsequent sowings, the grower will retain some of each year's crop, practising selection with as much care, if not more, than he does for his maize crop. Increased yields invariably follow the selection of mature, well-filled, even peanuts from the most prolific plants. This should be done in the field at harvest time, and will amply repay the trouble. The nuts selected for seed must be thoroughly dried and stored during the winter, in a well-aired barn, or hung in bags where the air can circulate freely among them. Overheating, and consequent injury to the germ, results from improper curing and drying. They must be harvested and cured without being frosted, or partial, perhaps total loss of vitality will result.

It is advisable to shell the nuts before sowing, for the following reasons :—

1. A better stand results, since shelling eliminates the danger of sowing immature or badly filled pods.
2. Overcrowding—which results if two or more kernels germinate—is avoided.
3. Uniformity of germination.
4. Earlier maturity.
5. Economy of seed.

Small varieties, such as "Spanish"—the pods of which are invariably well filled—are usually sown without shelling, since overcrowding, and the fact of being a few days later in germinating, is of no great consequence.

The nuts can be most satisfactorily prepared for sowing by hand-shelling, owing to the danger of injury to the germ by machinery. Care must be taken to avoid rupturing the red skin (testa) of the nut, and to discard all small, shrivelled, mouldy, or otherwise imperfect kernels.

"The manner in which unshelled nuts germinate is rather curious. The germination of the kernels is not simultaneous. One germinates first, and its radicle penetrates the pod ; the plumule growing upward carries with it the other kernel covered by the shell not yet germinated ; this kernel is forced nearly to the surface of the soil, falls to one side, and then germinates. The process occupies six to eight days, and if the surface moisture of the soil has then dried up, the second kernel has difficulty in germinating unless rainfalls."*

Varieties.

The varieties of peanuts in general cultivation are variously classified, according to the habit of growth and the size of the pea ; some have an erect, bunched habit, while others possess spreading branches, which lie flat on the ground. The former are more generally grown since they can be sown closer together and are easier to cultivate and harvest.

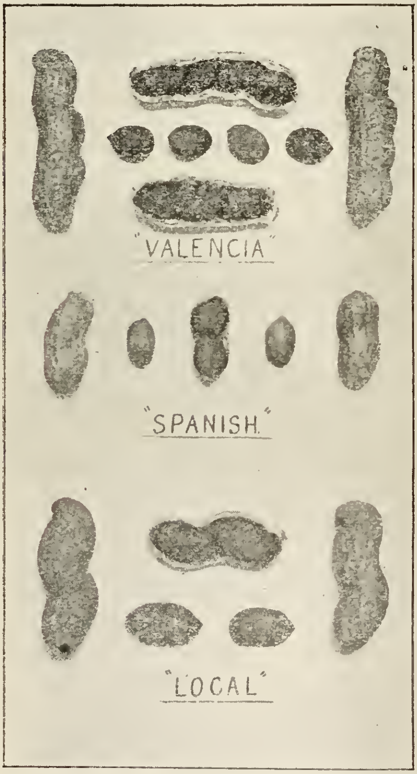


Fig. 5.—Varieties of Peanuts undergoing Trial.

Large podded varieties are more select in their soil requirements and more apt to produce unfilled pods if the conditions are not quite satisfactory. Generally speaking, the small nuts are hardier, and better adapted to adverse soils and climates.

The varieties which have been tested in departmental trials were introduced from the United States of America, with the exception of one variety which has been termed "Local," and whose origin is not known ; it was probably imported by Chinese gardeners from their native land (Fig. 5). The only other varieties which have come under the notice of the Department are a large podded variety similar to "Local," called "Giant," and the dwarfed variety usually grown and retailed by Chinese gardeners.

Although the American varieties have given results which evidence their adaptability to our soils and climate, it must be admitted that none of them quite equal for roasting purposes the nut imported from China and Japan. They answer the requirements of the trade for confections and oil extraction, but since the demand is, in the first instance, for roasted peanuts, more suitable varieties may have to be found to supply this demand.

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* Bulletin of the Imperial Institute. Vol. XIV, No. 3, p. 473.

The varieties which have been under trial by the Department of Agriculture in this State may be described as follows:—

Spanish.—This is a strong-growing, very hardy variety, with small pods about 1 inch in length; foliage fairly abundant, and stems erect. The pods are borne in a compact cluster centred about the tap root, to which they firmly adhere in harvesting. Each pod is completely filled by two light brown peas. The kernels are small, but sweet and well flavoured, and are in strong demand by confectioners. Unfilled pods are very rare. It is the earliest of the varieties tried, maturing in from 100 to 110 days. It is very prolific, yielding at Grafton Experiment Farm as high as 121 bushels per acre. Spanish is very drought-resistant, and will thrive under a wider range of soil and climatic conditions than other varieties. On account of its diminutive size and invariably well-filled pods, it is rarely shelled for sowing. The foliage makes excellent hay, but is not so abundant as in the larger podded varieties. Spanish is grown largely for the shelled peanut trade, and for the manufacture of peanut butter and confections.

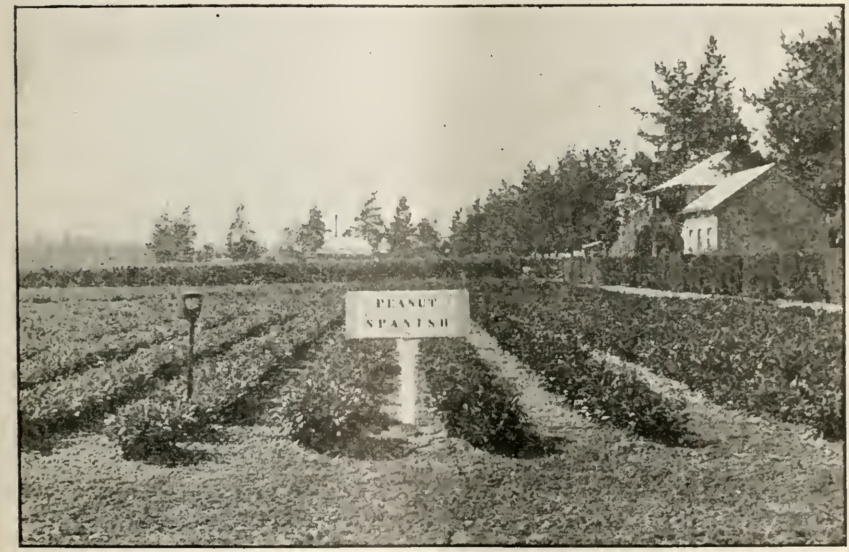

Fig. 6.—Varieties of Peanuts, "Spanish"

The oil content is 7 to 10 per cent. higher than most other commercial varieties, and for that reason it is a variety that is extensively favoured for oil production. Thirty pounds of high-grade nuts will yield one gallon of first-class oil and 20 lb. of meal of high feeding value. (Fig. 6.)

Valencia.—This variety has given the most consistent results, if not the highest individual yields, of the varieties imported from the United States. It has a bunch habit of growth, the foliage being very abundant and of a dark green colour. The pods are medium-sized, clean and bright, containing three to five tightly-packed, dull red-coloured nuts of excellent flavour.

They are clustered principally around the tap root, and adhere well to the vines in harvesting. The highest yields obtained were 112½ bushels at Grafton Experiment Farm in 1915, and 107¾ bushels at Yanco Experiment Farm in the same year. The average yield of this variety at the former farm for three years was 91¼ bushels. It has invariably given good results in a diversity of soils and under variable weather conditions. Undoubtedly drought-resistant, its luxuriant growth of soft, leafy vine is particularly valuable.

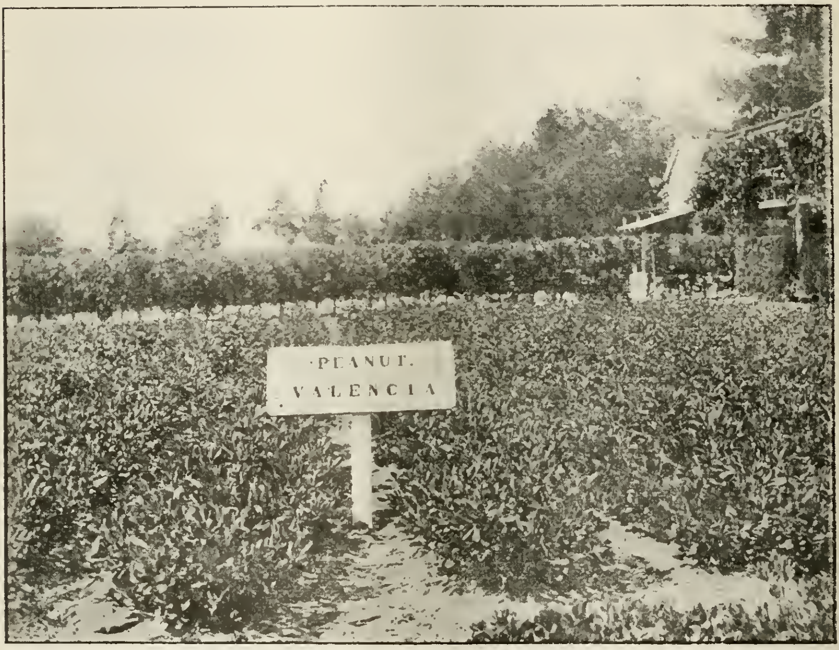

Fig. 7.—Varieties of Peanuts, "Valencia."

Samples of this variety were submitted to a Sydney firm for roasting, and were reported to be "equal in flavour to the best imported nuts, and suitable for the trade." The small size and dark red colour of the kernels, however, rather detract from the value of the variety for this purpose. On account of their superior flavour, the nuts are keenly sought for by confectioners. It is a mid-season variety, maturing in about 120 days. The weight per bushel is 22 lb. (Fig. 7.)

Virginia Bunch.—This, as the name implies, is a bunch type, with large pods of irregular shape, 1½ inches to 2 inches in length, foliage abundant, and of a light green colour. The pods are of bright appearance, and are developed around the base of the plant. The nuts, of which there are usually two in a pod, are held loosely, and are of a light brown colour.

It was observed in the trials that the percentage of unfilled pods or "saps" was comparatively high. Virginia Bunch is used extensively in the United States for roasting; but samples submitted to a Sydney merchant were considered unsuitable, for "not only were the nuts of inferior flavour, but the shells varied in thickness at the ends, and consequently were very difficult to roast." The variety gave a yield at Grafton Experiment Farm in 1913 c 124½ bushels per acre, but in view of their inferior roasting qualities, trials were discontinued from that year. A bushel of this variety weighs 22 lb.

Local.—The history of this variety is not known. It has been employed in trials as a "check" variety for comparison with those introduced from America. It is large podded, with strong-growing, coarse, creeping stems, along which the pods are borne in profusion. The pods are large, 1¼ inches to 1¾ inches in length, irregular in shape, and containing, on the average, two pink-coloured nuts of medium flavour. Its yield at Yanco Experiment Farm in 1915 was exceptional—118 bushels—but this has not been supported by similar yields at other farms. The variety matures earlier and is lower in oil content than Valencia. As a drought-resister it is much inferior to the American varieties, as was evidenced by the 1915 trials at Grafton Experiment Farm. Samples submitted for roasting were reported to be "rather hard and dry eating." It seems to be characteristic of this variety to produce a large percentage of "saps." This defect has been consistently noticed at all the experiment farms; the imported varieties grown under the same conditions have given excellent results, which seems to indicate a varietal weakness.

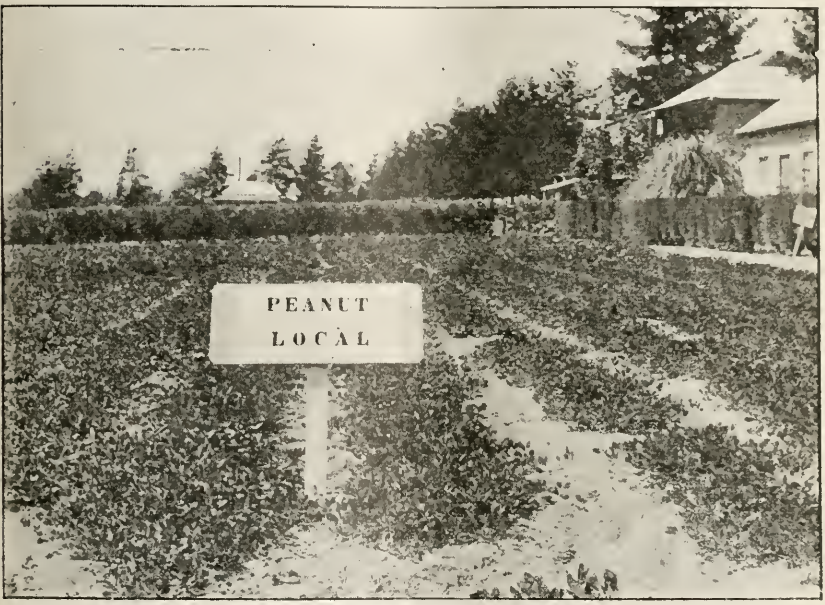

Fig. 8.—Varieties of Peanuts, "Local."

Generally speaking, Local has proved inferior to the introduced varieties in point of yield and quality. Owing to its spreading habit of growth, it is more difficult to harvest than the bunch type. It produces abundant foliage, which cures well as hay. The bushel weight of the variety is 22 lb. (Fig. 8.)

The following varieties have not yet been introduced into this State, but are commercially successful in the United States of America.*

Virginia Runner.—This is a large-podded, strong-growing variety, with creeping stems and heavy foliage. The pods are scattered along procumbent stems, and do not adhere well in digging. The nuts are similar to Virginia Bunch.

Tennessee Red.—This is a small-podded variety, similar to Valencia, but of inferior quality. The pods are medium in size, containing five or six peas crowded together. The nuts are covered with a dark red coloured testa, which lowers their market value considerably. The variety is well adapted for stock feeding. It is somewhat similar to Valencia in appearance.

African or North Carolina.—This is a rank-growing procumbent variety, with dark green luxuriant foliage. The pods are scattered along the stems, and are medium in size, usually containing two peas. These are rich in oil, and are of excellent flavour. It is a late maturer. In Africa it is extensively grown for oil production.

Running and Bunch Jumbo.—These are two varieties which differ only in their habit of growth, as the names imply. The pods are similar to those of Virginia Bunch, but have a greater tendency to produce "saps." They are chiefly grown for roasting purposes, but are gradually being superseded by more reliable yielders. The period of maturity is approximately 160 days.

Time of Planting.

Peanuts are planted in the spring of the year, but not until all danger of late frost is over and the soil is warm. If the ground is cold, germination will take place slowly and irregularly. The Departmental experiments indicate that the most suitable times for sowing the main crop are:—

North Coast: September—3rd and 4th weeks.
Central Coast: October—1st and 2nd weeks.
South Coast: October—2nd and 3rd weeks.
Murrumbidgee Irrigation Area: October—2nd and 3rd weeks.

Being more susceptible to frost, and requiring a warmer soil for its successful germination, the peanut crop should be sown a little later than for main crop maize sowings. The Spanish variety is early in maturing, and can be sown two or three weeks later. As far as possible, the sowing should be arranged so that the crop will be harvested when dry weather can reasonably be expected.

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* Farmers' Bulletin 431, U.S. Dept. of Agric.

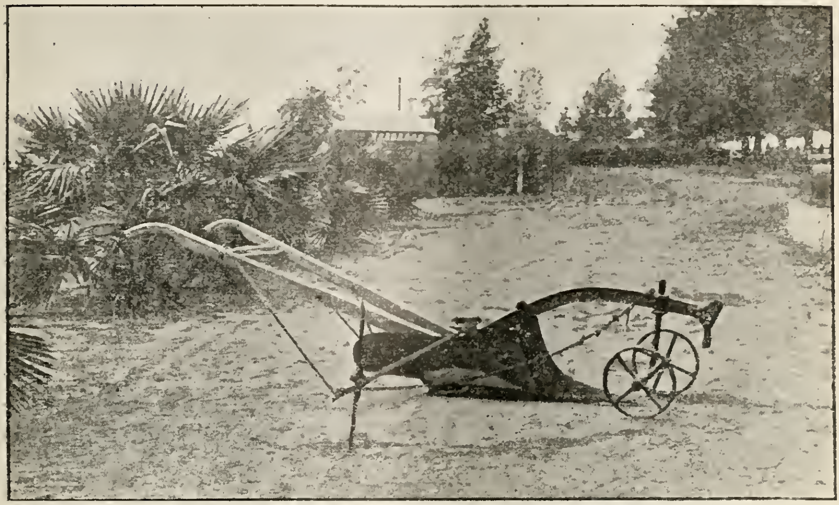


Fig. 9.—A Suitable Type of Drill Plough. A—Side View.

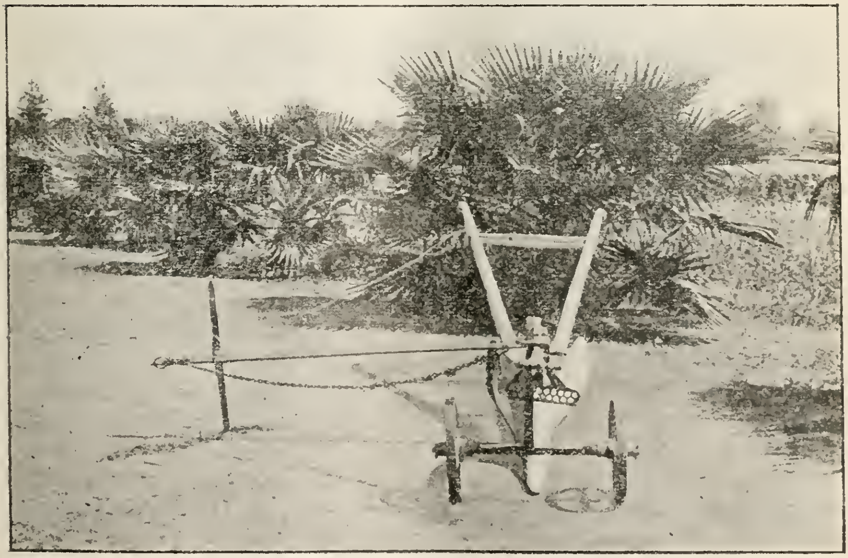


Fig. 9.—A Suitable Type of Drill Plough B—Front View.

THE PEANUT.

Quantity of Seed.

To sow an acre, 27 to 35 lb. of unshelled nuts, or 8 to 10 lb. of shelled nuts, are required. The quantity depends chiefly on the variety, the distance apart in the rows, and the width of the drills. The small-podded varieties, such as Spanish, usually sown without shelling, require 1 bushel (in the pod) per acre. If these small varieties are shelled, 7 to 8 lb. of seed will be required per acre.

Methods of Sowing.

The method adopted in small areas is to mark out the ground in drills with a hand plough, drop the seed by hand, and cover with the plough or rake. On extensive areas, where the peanut crop has taken a permanent place in the rotation of the farm, and is, perhaps, the chief source of revenue, the use of machines becomes necessary. The land is marked out in drills, as for maize, but not so deeply, using an ordinary plough or one of the special drill ploughs on the market (Fig. 9, A and B). The distance apart of the drills will depend upon districts and on varieties. In typical districts, drills 3 feet apart and seeds every 18 to 24 inches in the drills is sufficient for the strong-growing varieties, such as Local; for medium varieties, such as Valencia, 2 feet 9 inches between drills, and plants 15 to 18 inches apart, will be found satisfactory; while for small varieties, such as Spanish, drills separated by 30 inches and plants by 12 to 15 inches will give satisfaction.

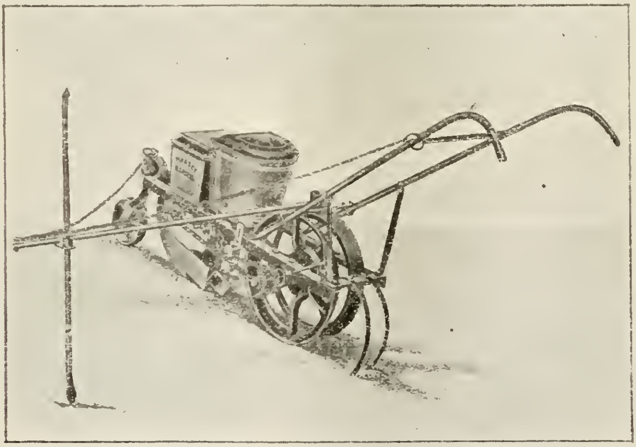


Fig. 10.—One type of Maize Drill, with Fertiliser Attachment.

In the United States the seed is sown by a special peanut planter, similar in many respects to the maize-dropper. The implement is not fitted with a fertiliser attachment, but special machines for marking out the land and applying the fertiliser are on the market. These are very reliable, and are great labour-saving appliances.

Very satisfactory work can be done with the ordinary maize-dropper (Fig. 10), by fitting special plates. The chief danger is that the nuts may be broken, but this can be obviated by careful adjustment. If the seed has been graded and the machine properly set, single nuts will be dropped uniformly at the set distance. To the front of the dropper may be attached mould-boards, so that the furrows may be run out and the seed and fertiliser sown in the one operation. This is particularly advantageous in hot localities where the drills are apt to dry out quickly. It ensures the seed being deposited in moist soil, and effects a saving of labour. Machines for sowing nuts in the pod have not yet been widely adopted. Unshelled nuts may be dropped by hand in the drill, and covered by a single cultivator with mould-board attachments or by two broad tines attached to the adjustable side-standards.

The seed should be covered to a depth of $1\frac{1}{4}$ inches in sandy soil and 1 inch in heavier soil if it is in a fine moist condition. Slightly deeper covering will be necessary if the soil is inclined to be dry at the surface.

(*To be continued.*)

SEED WHEAT FOR SALE AT THE GOVERNMENT FARMS.

THE Department of Agriculture has a limited quantity of Pure Seed Wheat for sale for the coming season. The price of the Seed is 6s per bushel, plus 9d. for each bag supplied, f.o.r. nearest railway station to the Farm supplying. Applications should be made direct to the Manager of the respective Farms.

Variety.	Farm where seed is available.	Variety.	Farm where seed is available.
Hard Federation	Wagga Experiment Farm, Bomen.	Federation	Cowra Experiment Farm.
Marshall's No. 3		Hard Federation	
Canberra		Yandilla King	
Bomen		Marshall's No. 3	
Yandilla King		Zealand	
Comeback		Rymer	
Bunyip		Commonwealth	
Zealand		Warren	
		Canberra	
Cleveland	Bathurst Experiment Farm.	Currawa	
Yandilla King		Bomen	
Marshall's No. 3			
Hard Federation		Warren	Glen Innes Experiment Farm.
Federation		Genoa	
Comeback		Canberra	
		Thew	
Federation	Temora Demonstration Farm.	Florence	
Hard Federation			
Florence		Steinwedel	Coonamble Experiment Farm.
Firbank		King's Early	
Canberra		Warren	
Comback		Canberra	
Bunyip		Walmer	
Bomen		Florence	
Sunset			
		Florence	Condobolin Demonstration Farm.
Steinwedel	Nyngan Demonstration Farm.	Canberra	
Firbank		Hard Federation	
Florence		Sunset	
Sunset			

Popular Descriptions of Grasses.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE RYE OR LOLIUM GRASSES.

THE cultivated rye grasses are :—

Perennial Rye grass (*Lolium perenne*). (Fig. 1.)
Italian Rye grass
Loietto Rye grass
Westernwolth's Rye grass } *Lolium italicum* or *Lolium multiflorum* (Fig. 2).

The rye grasses of little agricultural importance are :—Drake or Darnel (*Lolium temulentum*) (Fig. 3) and *Lolium rigidum* (Fig. 4).

The rye or Lolium grasses have a very characteristic structure. The flowers of the spikelets overlap, as in the Fescues, but the whole seed head or spikelet is placed edgewise to the flowering stalk, often becoming closely appressed to it. It is the last-named feature which readily distinguishes these grasses from others.

Perennial Rye Grass (*Lolium perenne*).

Perennial rye grass can be distinguished from the other rye grasses by the following characteristics :—

1. The plant is perennial.
2. The root is more tufted, containing a larger number of basal leaves.
3. The flowers are usually without awns or bristles, and there are comparatively fewer in a spikelet or seed head.

Perennial rye grass is probably the oldest and most popular cultivated grass throughout the temperate regions of the globe. It is shown by references that its cultivation in England has extended as far back as 1650. On good soils it is extremely palatable to both sheep and dairy cattle.

In New South Wales it is largely grown on the coast and tablelands. Some very fine pastures may be seen on the richer volcanic soils of the South Coast during the spring months of the year. On the lighter sandy or clayey soils it is crowded out by the more vigorous couch and Parramatta grass, and also by Rib grass or Lamb's Tongue. In the coastal districts it will provide feed up to December, when it goes off until the following autumn. In the New England district, however, it is grazed during the greater portion of the year. Perennial rye grass is very quickly affected by hot, dry conditions, and its cultivation is not recommended west of the more elevated tablelands.

Perennial rye grass should not be allowed to seed during its first year, as this destroys its permanence. Seed from old pastures is likely to give better results than from pastures two or three years old.

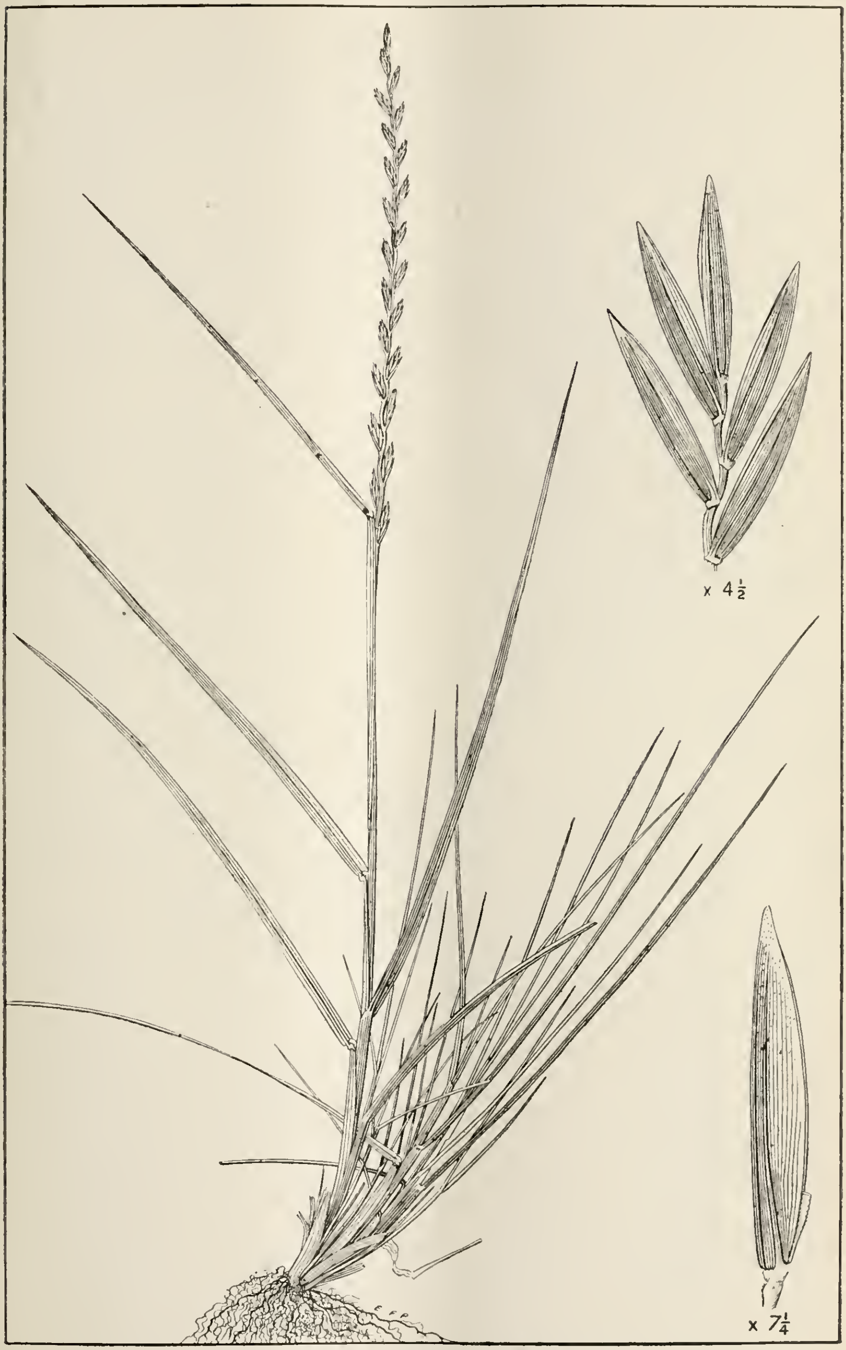


Fig. 1.—Perennial Rye Grass (*Lolium perenne*).
Note the tufted root, and also the absence of awns or bristles on the seed head.

POPULAR DESCRIPTIONS OF GRASSES.

Rye grass is best sown in the autumn. It should not be sown alone, but either with clover or with cocksfoot and clover. Owing to its good germinating capacity, less seed per acre is required than of many other grasses. If sown with clover, 20 lb. of rye and 10 lb. of clover are sufficient; if with cocksfoot and clover, 20 lb. of Perennial rye grass, 10 lb. of cocksfoot and 4 lb. of clover.

Rye grass is generally one of the principal constituents of lawn-grass mixtures, as sold by seedsmen. In lawns established from these mixtures the rye grass soon obtains the supremacy, owing to the high germination of the seed and the rapid growth of the grass. Rye grass lawns are suitable on the tablelands, but may be seriously affected on the coast by rust due to moist conditions, or by wilting during hot dry winds.

Lolium italicum or *Lolium multiflorum* and its Varieties.

These embrace Italian Rye grass, Loietto and Westernwolth's rye grass.

Italian rye grass is easily distinguished from Perennial rye grass, (1) by its awned flowers, (2) by the more vigorous leaf growth along the stem, and (3) by its annual or biennial character. It is a native of Italy, and is sometimes botanically called *Lolium italicum*, sometimes *Lolium multiflorum*.

Owing to its short-lived habit, it is unsuitable for permanent pasture. It is, however, an excellent hay grass, and can be used in rotations with advantage. It can also be sown with certain cereals, using the latter as cover crops. On the coast good results have been obtained by seeding it with oats, the first cut producing an excellent mixture of oaten and grass hay, while the aftermath provides excellent pasture well into the spring.

Almost any soil will suit Italian rye grass, but the best results are produced on alluvial or basaltic soils. In the New England district and in many parts of the South Coast, on basaltic soil, it yields heavily. Grown with red clover it produces a couple of cuts of excellent hay each season.

On good land it can be seeded heavily, at the rate of 40 to 50 lb. per acre. The seed is best sown in the autumn; the growth throughout the winter months is good, and the stand is then ready for cutting in the spring.

Loietto rye grass.—This variety is credited with being an improved form of Italian rye grass, which is largely grown in Italy. Some seed brought from that country by Mr. W. J. Allen, Fruit Expert, was sown at Yanco Experiment Farm during 1914–15, and later was also tried at Glen Innes Experiment Farm. There is no evidence that it is superior to the ordinary Italian rye grass in the New England district. Mr. T. A. Stirton, Ben Lomond Estate, Ben Lomond, to whom seed was sent for trial, writes:—"The Loietto seed was sown on heavy black soil. The germination was poor and the plants not luxuriant. Westernwolth's rye has beaten it in germination and luxuriance."

Two reports have been received from the Yanco Irrigation Area. The officer connected with the Irrigation Commission reports:—"Half an acre was sown on 20th May, 1916, at the rate of 2 bushels per acre, on land that

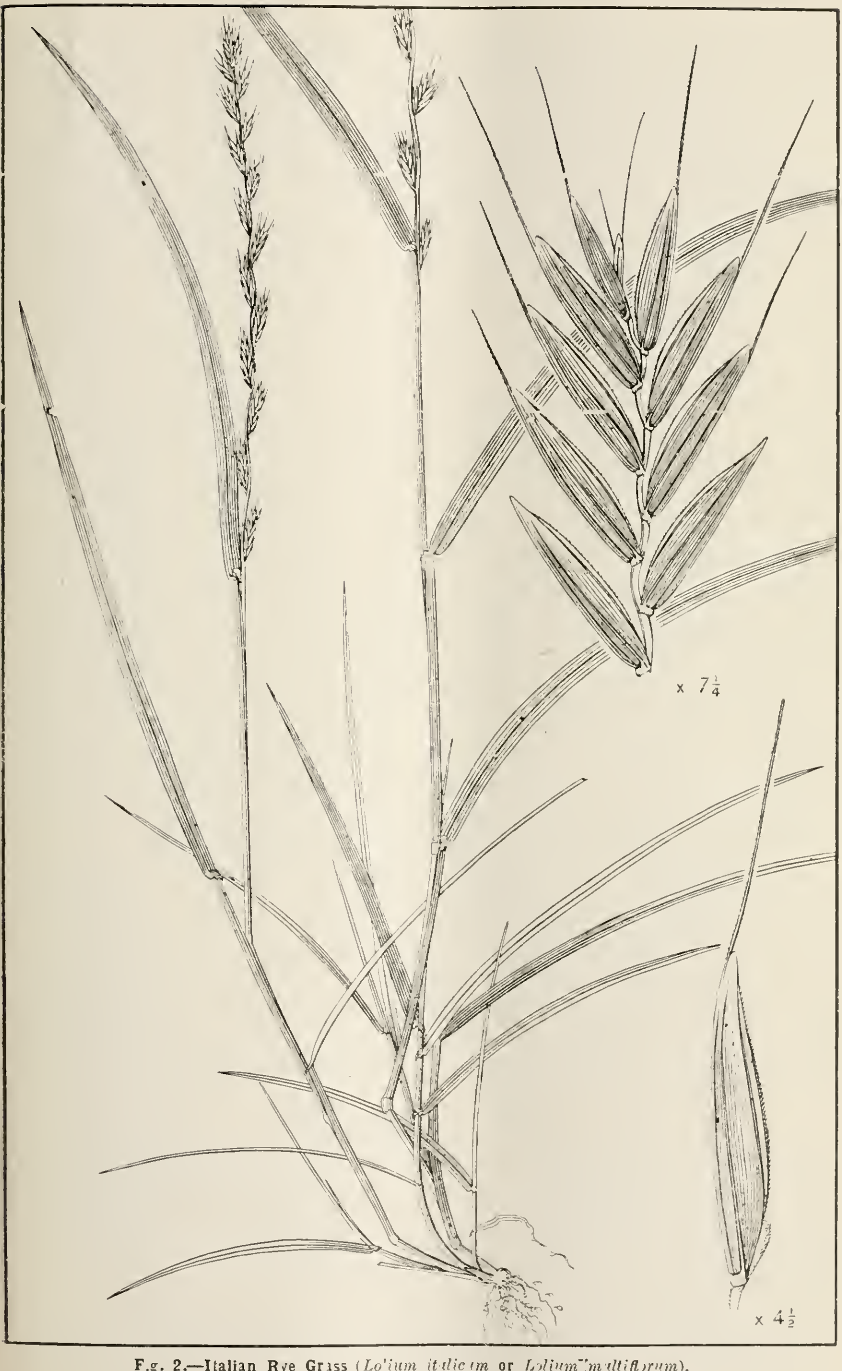


Fig. 2.—Italian Rye Grass (*Lolium italicum* or *Lolium multiflorum*).
Loietto and Westernwolth's Rye Grass are other varieties of the same grass.

POPULAR DESCRIPTIONS OF GRASSES.

had never been irrigated. The soil was a stiff red loam, about 8 inches deep, overlying a dark red clay subsoil of 4 or 5 inches. The land was well cultivated and harrowed down to a fine seed-bed about the same as for wheat, but not as fine as for lucerne. The season was very favourable. The grass germinated well, and made uniform and rapid growth. Six weeks after planting it was 9 inches high and fit for grazing. It grew well through the winter, and was irrigated at the end of October. On 20th November it was cut with a mower, and yielded in its dry state 3 tons 6 cwt. per acre. It shot up again, and in December reached a height of 12 inches. The hay was of an excellent quality, and was readily eaten by horses and cattle." It should be noted that in this case Westernwolth's rye grass was not grown for comparison.

At Yanco Experiment Farm both Loietto and Westernwolth's have been grown, and Mr. J. M. Pitt, Experimentalist, reports as follows:—"The Loietto grass closely resembles Westernwolth's rye grass, having a similar method of growth, with the shiny leaves and seed-producing stalks typical of the rye grass family. Westernwolth's has given far better results. Its growth during the early stages has been more rapid. It carries a greater quantity of leaf of a slightly wider type, and the foliage reaching further up the stem. The Loietto grew to a height of 2 feet, whereas Westernwolth's reached 3½ feet. To the eye Westernwolth's has a more taking appearance."

Westernwolth's rye grass.—Full particulars of this grass have already been published in the *Agricultural Gazette.* It is becoming increasingly popular, and in many parts of New Zealand has displaced Italian rye grass in rotations, and as a hay crop. A thin seeding of this grass is strongly recommended in most winter mixtures on the coast. It comes away quickly, shelters the other grasses, and provides early grazing.

On the coast and on the Irrigation Area it does well, but it does not appear suited to the tablelands. At Yanco Experiment Farm it has shown particular promise, and should prove a valuable adjunct to winter crops.

This grass is of such commercial importance that seedsmen have given it a distinct specific title, viz., *Lolium westernwoldicum.* Botanically, however, there is no distinction between this grass and the different commercial varieties of *Lolium italicum* (*Lolium multiflorum*).

Other Rye Grasses.

Lolium temulentum (Drake or Darnel).—This grass can be distinguished from the other rye grasses by its extremely long outer glume; sometimes it is as much as an inch long, and it is always longer than the five to seven-flowered spikelet. It is of an annual character, generally growing fairly tall. The seed, in its ripe stages, is often very inflated.

Most botanical authorities recognise two forms of this grass, viz., Bearded Darnel, having long awns, and Short-awned Darnel, having very short awns or none at all. The latter form is sometimes called *Lolium arvense.*

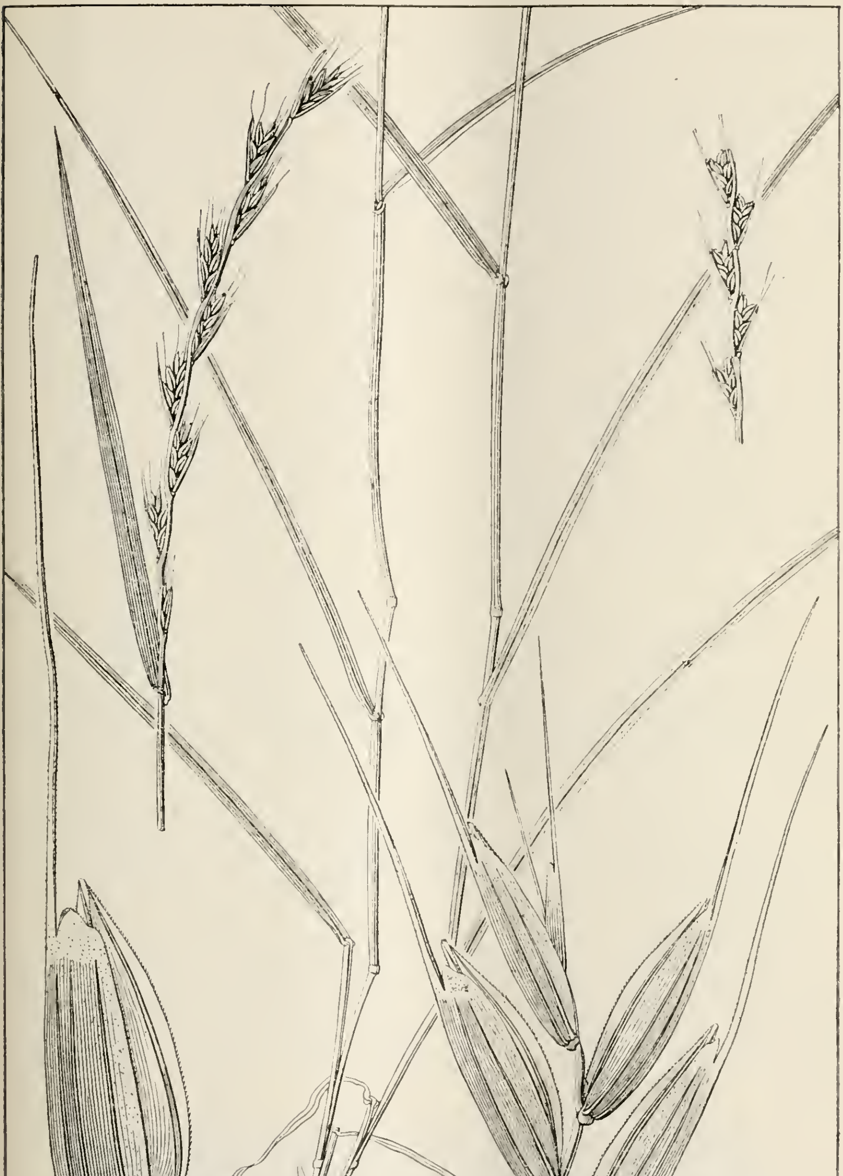


Fig. 3.—Drake or Darnel (*Lolium temulentum*).
Note the extremely long outer glume,

Popular Descriptions of Grasses.

Although never very abundant, this grass is fairly common throughout the tablelands and coast districts of the State, and is becoming an annual feature of many of our wheat fields. It has been introduced from Europe and Asia, where it is generally common and is considered a weed.

The flag is of a succulent and palatable type, and is appreciated by stock. The seed of the grass, however, contains a narcotic poison, which may be due to a fungus, and therein lies the danger of permitting it to be introduced into wheat fields, or in cultivation paddocks generally.

Lolium rigidum (Rigid rye grass).—As its name implies, this grass has somewhat of a rigid character, noticeable in the stem and spikelets. The outer glume of the spikelet is very rigid, and the spikelet itself is often so closely appressed to the stem of the plant that the flowers present an intricate or overlapping appearance. The grass never grows to any great height, and it is the shortest of all the rye grasses.

It has been introduced from Europe, being very common in Italy. In this State it is a familiar sight on the seaside of the middle coastal district, and also on river banks. It is very inferior to the other rye grasses, and cannot be recommended for cultivation.

PURE SEED MAIZE—CO-OPERATION BY FARMERS.

Owing to the value of acclimatised seed maize, and the danger of its becoming impure in cross-fertilisation, it has been the policy of the Department, in order to ensure pure seed being available to farmers, to have only one variety grown at each Experiment Farm, where it undergoes systematic improvement for yield and quality.

As these Experiment Farms are not representative of every large maize-growing district in the State, the principle has been extended to include other districts, where this improvement system has been undertaken under Departmental supervision, by the co-operation of reliable farmers in these districts.

In order to further extend this work and to cater for other important maize-growing centres, the Department would be glad to hear from farmers who are already specialising in, or who are willing to specialise in, the production of pure seed maize by co-operation with the Department.

All communications should be addressed to the Under Secretary and Director, Department of Agriculture, Sydney.

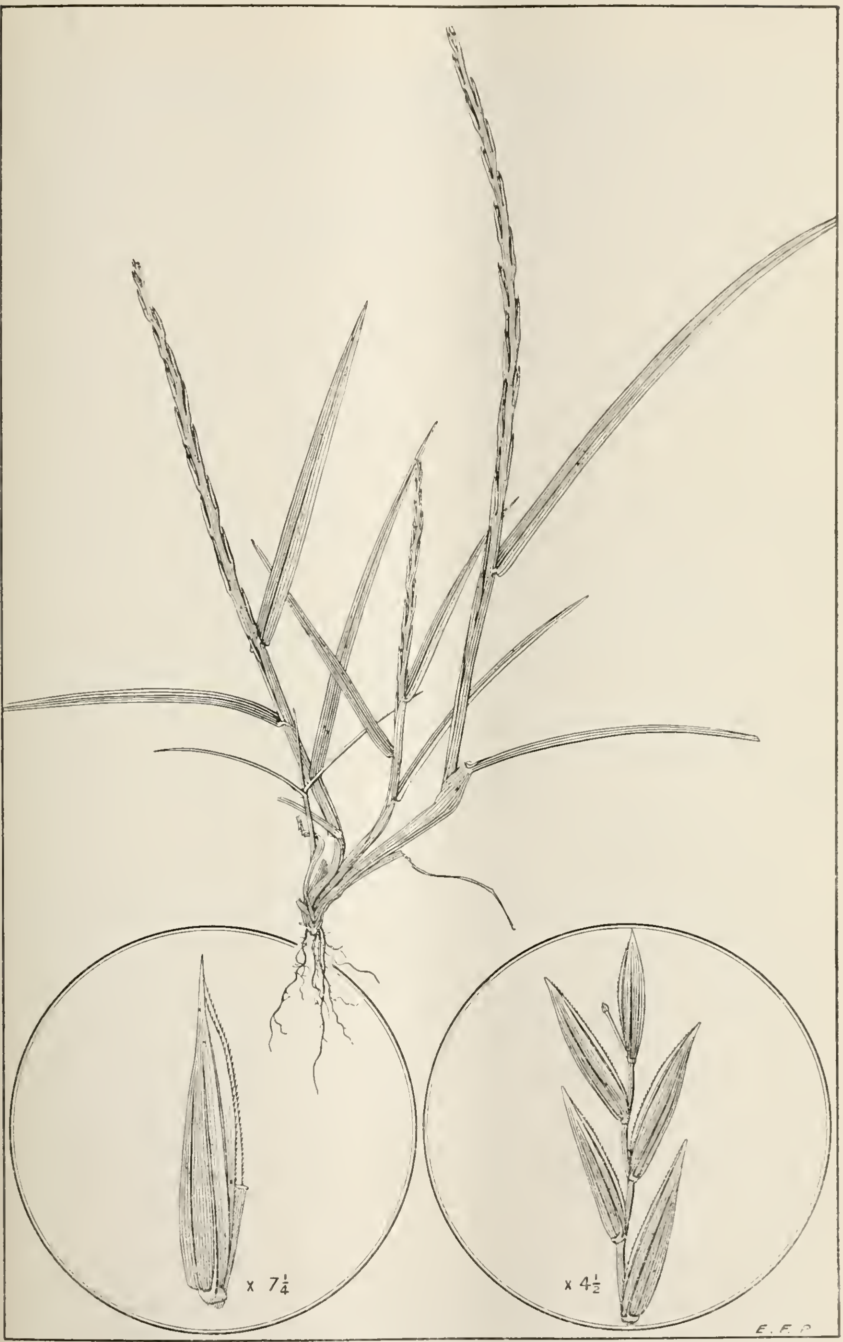


Fig. 4.—Rigid Rye Grass (*Lolium rigidum*).

POPULAR DESCRIPTIONS OF GRASSES.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1917–18.

South Coast District.

R. N. MAKIN, Inspector of Agriculture.

THE following farmers co-operated with the Department in carrying out variety and manurial tests with potatoes during the past season :—

J. H. Martin, Pambula.
J. Chittick, Kangaroo Valley.

Owing to an exceedingly wet season at Kangaroo Valley no potatoes were harvested—wet rot having accounted for the tubers. The seed was sown on the 21st August, and satisfactory growth was made until heavy rain at Christmas time started disease among the plots. The rain was so persistent that it was impossible to get on the ground.

At Pambula continuous rain caused a certain amount of rot, but it was not so heavy nor so continuous as at Kangaroo Valley. Under the conditions the returns are most satisfactory. The planting was made on 4th September, and digging took place on 20th February. The rainfall between these dates was 2,213 points, of which 1,100 points fell in January. The seed was sown at the rate of 12 cwt. per acre, in drills 3 feet apart and 15 inches between sets. Superphosphate was dusted along the drills at the rate of 2 cwt. per acre in the variety trial.

In the manurial tests superphosphate was applied at the rate of 2 cwt. per acre, P5 (consisting of superphosphate 4 parts and sulphate of potash 1 part) at 2½ cwt. per acre, and P7 (consisting of equal parts of superphosphate and bone-dust) at the rate of 3 cwt. per acre. These were compared with an untreated plot. Superphosphate alone yielded 3 tons per acre better than the unmanured. Taking superphosphate as being worth £5 per ton, and potatoes at the low price of £5 per ton, the increase was equal to a gain of, roughly, £14 10s. per acre. In the plots treated with P5 and P7 mixtures respectively, there was an approximate gain of 1 ton. As sulphate of potash is very dear and practically off the market, it would be difficult to estimate the value of the treatment with P5, but the P7 mixture may be valued at £7 per ton, so that the gain due to the manure was commercially equal to £4.

In the variety trial Manhattan suffered most on account of the bad weather conditions. Carman No. 1 and Early Manistee withstood the wet very well, and yielded good marketable potatoes. Satisfaction was fair. Up-to-Date, which was used in the manurial tests, showed a certain amount of second growth, and yielded a number of small potatoes.

It was noted during the season that the growth was slow and maturity late. This was, no doubt, due to the cold and wet summer. In most districts on the South Coast farmers lost their potato crops through the incessant wet. The warning must again be offered against planting on anything but well-drained ground. The potato plot is one of the most expensive to plant, and precautions should be taken against wet conditions—even naturally well-drained ground should be drained in case storm-water tends to lodge.

SUMMARY of Returns from Plots sown by Mr. J. H. Martin, Pambula.

Variety Test.

	tons	cwt.	qrs.	lb.	
Manhattan	6	18	1	10	per acre.
Early Manistee	6	7	2	0	,,
Carman No. 1	7	6	2	16	,,
Satisfaction	6	12	1	4	,,
Up-to-Date	8	0	0	0	,,

Manurial Test.

	tons	cwt.	qrs.	lb.	
No manure	4	17	0	3	per acre.
Superphosphate, 2 cwt. per acre...	8	0	0	0	,,
P5 mixture, 2½ cwt. per acre ...	6	1	0	4	,,
P7 mixture, 3 cwt. per acre ...	6	0	0	0	,,

TAGASASTE AND THE GACIAS GROWING IN THE BOTANIC GARDENS.

IT is many years since the late Dr. Victor Perez, who resided in the Canary Islands, distributed throughout the world, through the Royal Botanic Gardens, Kew, seeds of Tagasaste, *Cytisus proliferus* L. f., var. *palmensis* Chr., and his son, Dr. G. V. Perez, of Teneriffe, an enthusiastic student and correspondent on plant acclimatisation, is now doing the same, through the same source, with seeds of Gacia and Gacia blanca, and trying to show that the Escabon of Teneriffe is not the Tagasaste of Palma.

Tagasaste was also fully dealt with by the Director, J. H. Maiden, F.R.S., in the *Agricultural Gazette* for October, 1915.

During the last few years seeds of these useful leguminous plants have been received direct from Teneriffe and grown in the trial ground of these gardens and in the gardens also, and I have come to the conclusion that it is doubtful whether the true Tagasaste, or Tree Lucerne, has really got abroad in this country. Many specimens I have seen are not the Island of Palma variety, but *Cytisus proliferus* L. f., known in Teneriffe as Escabon, which is not so proliferous in foliage as the variety *palmensis* Chr., and, according to correspondence from Dr. Perez, is seldom browsed upon by animals, unless pressed by hunger. This plant soon becomes leggy and woody, even when cut, and its foliage is more harsh and sparse. The Tagasaste, on the other hand, although differing only slightly botanically, is much more leafy in character and more robust, with a graceful drooping habit. I have also found it easier to transplant from the seed bed than the type. It sends down tap-roots early, making it a suitable subject for very dry positions. Plants are doing well where no artificial watering is given, and under the drying and impoverishing influence of large Moreton Bay Fig trees. Its quick growth makes it useful as a nurse break-wind until the intended permanent trees have become established. It is also useful as a nurse in new shrubbery and plantation work in either park or garden, and while so used makes a pleasing shrub from 8 feet to 15 feet high. It will stand the knife well, and can therefore be easily kept in check. For fodder purposes it should never be allowed to grow into a small tree, but should be kept regularly cut; the foliage is then always young and soft, when it is readily eaten by all kinds of stock.

Tagasaste is very accommodating in its requirements, in fact it could easily become a pest in some districts where it would be replacing something better than itself; but in dairy districts where the "something better" cannot always be maintained through droughts and other causes, and catch crops of spring and autumn fodder sometimes fail, it will be a safe and profitable standby, especially if it is cut at least twice a year.

It will bear considerable heat; and that it will grow well in the frost zone is proved by its becoming established in the Moss Vale district, while Mr. Maiden states that it grows in the coldest parts of the Blue Mountains.

The Gacia *Cytisus stenopetalus*, Webb and Benson, makes a beautiful, sweet-scented, yellow flowering shrub, not so large in growth as the Tagasaste but just as robust, with thick green foliage responding readily after the knife. A shrub of Gacia in flower looks just like a giant of the well-known *Genista fragrans (Cytisus fragrans)* Lam., which is grown so largely in the Channel Islands and French nurseries for sale in the London Covent Garden market in 5-inch pots.

Gacia blanca *Cytisus pallidus* Poir is even more beautiful as a garden shrub than the Gacia, because of its silver foliage making a charming contrast amongst other shrubs. It is more upright in growth, but its warm sulphur yellow flowers are identical.

Both the Gacias make an excellent hand-fed fodder and silo material if kept cut as the Tagasaste, and where bees are kept greatly help the honey flow when in flower.

If the seed is sown as soon as ripe it will germinate readily, but if allowed to remain on the plant until it drops, it becomes very hard, like many other legumes. In this case the seed should be dropped into water nearly boiling, and allowed to remain in the water until it cools. All bought seed should be treated in this way.

Small quantities of seed of these plants, viz., the true Tagasaste, Gacia and Gacia blanca, are available for distribution.

Applications should be made to the Director, Botanic Gardens, Sydney, enclosing a penny stamp for postage.—E. N. Ward, Superintendent, Botanic Gardens.

Sales of Departmental Dairy Stock.

Two very successful sales of surplus stud dairy stock have recently been held by the Department, one at the Government Experiment Farm, Wollongbar, on Friday, 8th March, and the other at the Berry Sale Yards on Tuesday, 19th March, 1918.

Guernseys at Wollongbar.

The twenty-two animals sold totalled £1,339 16s., or an average of £60 18s. per head. In one case 160 guineas was paid by Messrs. Kinross Bros., of Inverell, for Caress of Wollongbar; and in another 105½ guineas was paid by Mr. G. Knight, of Wollongbar, for Rohais Lassie 3rd.

The general details are as follows:—

COWS.

Princess Alice: Born 16th March, 1911; colour, lemon, fawn and white; sire, Calm Prince; dam, Rose Vivid. 61 guineas. (J. Robbins, Federal.)

Sweetheart: Born 7th January, 1909; colour, lemon, fawn and white; sire, The Admiral; dam, Souvenir of Wollongbar. 51 guineas. (Kinross Bros., Inverell.)

Lass of Berry: Born 15th March, 1911; colour, lemon, fawn and white; sire, King of the Roses (imp.); dam, Rohais Lassie (imp.). 62 guineas. (J. Robbins, Federal.)

Red Rose of Berry: Born 10th June, 1911; colour, lemon, fawn and white; sire, Calm Prince; dam, Parson's Red Rose 1st (imp.). 94 guineas. (G. Knight, Wollongbar.)

Lucino: Born 15th August, 1911; colour, lemon, fawn and white; sire, Calm Prince; dam, Angel Vivid. 24 guineas. (J. Gibson, Wollongbar.)

Moonshine: Born 27th October, 1911; colour, lemon, fawn and white; sire, King of the Roses (imp.); dam, Evening Star. 48 guineas. (J. M. Hewitt, Lismore.)

Angelica of Berry: Born 12th January, 1912; colour, orange, fawn and white; sire, Claudius (imp. in dam); dam, Angelica 8th (imp.). 30 guineas. (J. Robbins, Federal.)

Rohais Lassie 3rd: Born 11th February, 1912; colour, orange, fawn and white; sire, Trengwainton Village Favourite (imp.); dam, Rohais Lassie (imp.). 105½ guineas. (G. Knight, Wollongbar.)

Flaxy 4th: Born 16th August, 1912; colour, lemon, fawn and white; sire, Rosehill (imp.); dam, Flaxy 3rd. 70 guineas. (W. R. Watkins, Kyogle.)

Kiss: Born 6th March, 1912; colour, lemon, fawn and white; sire, Hayes' Fido (imp.); dam, Sweetheart. 48 guineas. (Kinross Bros., Inverell.)

Golden May of Wollongbar: Born 4th September, 1912; colour, orange, fawn and white; sire, Hayes' Fido (imp.); dam, Miss Golden of Wollongbar (imp. in dam). 50½ guineas. (G. Osborne, Channon.)

Cato of Wollongbar: Born 26th December, 1912; colour, orange, fawn and white; sire, Hayes' Fido (imp.); dam, Token. 57 guineas. (J. Robbins, Federal.)

Caress of Wollongbar: Born 12th September, 1913; colour, lemon, fawn and white; sire, Trengwainton Village Favourite (imp.): dam, Angel Vivid. 160 guineas. (Kinross Bros., Inverell.)

HEIFER.

Clover of Wollongbar: Born 4th April, 1915; colour, lemon, fawn and white; sire, Sweetheart's Fido; dam, Shamrock 3rd. 50 guineas. (J. Robbins, Federal.)

BULLS.

Sunflower of Wollongbar: Born 10th March, 1917; colour, lemon, fawn and white; sire, George 3rd; dam, Flower of the Preel 3rd (imp.). 30 guineas. (J. Bugden.)

George 4th of Wollongbar: Born 16th February, 1917; colour, orange, fawn, and a little white; sire, George 3rd; dam, Anna. 85 guineas. (Campbell Bros., Mullumbimby.)

Leonard of Wollongbar: Born 20th November, 1916; colour, orange, fawn, and a little white; sire, George 3rd; dam, Leonie of Wollongbar. 35 guineas. (J. Hanstock, Brooklet.)

Emblem of Wollongbar: Born 26th January, 1917; colour, orange, fawn and white; sire, The Peacemaker; dam, Royal Souvenir of Wollongbar. 35 guineas. (J. Thompson.)

Beau of Wollongbar: Born 20th December, 1916; colour, orange, fawn and white; sire, The Peacemaker; dam, Caress. 50 guineas. (J. Sheehan.)

Glorious of Wollongbar: Born 7th March, 1917; colour, orange, fawn and white; sire, George 3rd; dam, Glory. 40 guineas. (J. Kerr, Kyogle.)

Haig of Wollongbar: Born 19th July, 1917; colour, orange, fawn and white; sire, General French; dam, Parson's Red Rose 6th. 45 guineas. (J. Knight, Wollongbar.)

Spark of Wollongbar: Born 12th August, 1917; colour, lemon, fawn, and white; sire, George 3rd; dam, Rose Vivid. 45 guineas. (J. Duncan, Numulgi.)

Holsteins from Berry Experiment Farm.

The twenty-nine head sold for a total of £1,337 10s. 6d., averaging £46 16s. per head. The highest price was paid—105 guineas—by Mr. J. G. Percival of Richmond, for La Hook 2nd, while 77½ guineas was given by the same buyer for La Field of Berry.

The general details are as follows:—

COWS.

Margosa of Berry: Born 3rd October, 1904; sire, Garfield (imp.); dam, Maggie Obbe. 35 guineas. (A. C. Lamond.)

Marigold of Berry: Born 20th February, 1907; sire, The Hague; dam, Margosa. 47 guineas. (A. C. Lamond.)

Marion of Berry: Born 27th May, 1911; sire, Hollander; dam, Margosa. 70 guineas. (A. C. Lamond, T. Connolly.)

Margaric of Berry: Born 23rd February, 1907; sire, The Hague; dam, Lady Margaret. 42½ guineas. (A. C. Lamond.)

Lady Hague: Born 3rd September, 1905; sire, The Hague; dam, Lady Frolic (imp. in dam). 35 guineas. (E. Woods.)

Lolkje Field: Born 12th November, 1904; sire, Garfield (imp.); dam, Lolkje. 41 guineas. (A. C. Lamond.)

La Hook 2nd: Born 5th August, 1912; sire, Froxfield Chevin Bob (imp.); dam, La Hook. 105 guineas. (J. G. Percival.)

Dazzler of Berry: Born 12th April, 1912; sire, Froxfield Chevin Bob (imp.); dam, Lolkje Zuyder Zee. 75 guineas. (A. C. Lamond.)

Dutch Oven 2nd of Berry: Born 23rd April, 1912; sire, Froxfield Chevin Bob (imp.); dam, Dutch Oven. 50 guineas. (G. Newman, Queensland.)

Madam Gerben of Berry: Born 5th August, 1912; sire, Froxfield Chevin Bob (imp.); dam, Gerben. 51 guineas. (A. C. Lamond, T. Connolly.)

Fraulein of Berry: Born 17th December, 1913; sire, Chevalier; dam, Fraulein Arama. 37 guineas. (J. G. Percival.)

Maria Field of Berry: Born 1st August, 1914; sire, Field Marshal; dam, Marion of Berry. 68 guineas. (A. C. Lamond, T. Connolly.)

Maggie of Berry: Born 16th July, 1914; sire, Field Marshal; dam, Margosa of Berry. 52½ guineas. (C. Behrendorff, Queensland.)

La Field of Berry: Born 22nd October, 1911; sire, Field Marshal; dam, La Hook 2nd of Berry. 77½ guineas. (J. G. Percival.)

Elegant of Berry: Born 23rd August, 1915; sire, Duke of Amsterdam; dam, Dazzler of Berry. 45 guineas. (C. Behrendorff, Queensland.)

HEIFERS.

Dazzler 2nd of Berry: Born 30th September, 1916; sire, Sultan La Polka (imp. N.Z.); dam, Dazzler of Berry. 63 guineas. (G. Newman, Queensland.)

Dazzler La Polka: Born 8th November, 1917; sire, Sultan La Polka (imp. N.Z.); dam, Dazzler of Berry. 38 guineas. (C. Behrendorff.)

Madam Gerben 2nd of Berry: Born 23rd September, 1916; sire, Sultan La Polka; dam, Madam Gerben of Berry. 43 guineas. (A. C. Lamond, T. Connolly.)

Maria Field 2nd of Berry: Born 1st December, 1916; sire, Sultan La Polka (imp. N.Z.); dam, Maria Field of Berry. 42½ guineas. (G. Newman.)

BULLS.

Maggie's Sultan: Born 13th January, 1917; sire, Sultan La Polka (imp. N.Z.); dam, Maggie of Berry. 15 guineas. (J. G. Percival.)

Gerben Sultan of Berry: Born 22nd September, 1917; sire, Sultan La Polka (imp. N.Z.); dam, Madam Gerben of Berry. £15. (G. Newman.)

Duke of Liege of Berry: Born 17th April, 1916; sire, Sultan La Polka (imp. N.Z.); dam, Double Dutch of Berry. 65 guineas. (E. Woods.)

Anglin's Sultan of Berry: Born 21st June, 1917; sire, Sultan La Polka (imp. N.Z.); dam, Margaret Anglin 2nd. £15. (G. Newman.)

Namur of Berry: Born 18th August, 1916; sire, Sultan La Polka; dam, Fraulein Arama. 30 guineas. (A. Hay.)

Duke of Berry: Born 9th July, 1917; sire, Sultan La Polka (imp. N.Z.); dam, Duchess of Hanover. £15. (G. Newman.)

Duke of Brussels: 35 guineas. (C. Behrendorff.)

Marso: £15. (G. Newman.)

Hook Sultan: 37½ guineas. (W. Percival.)

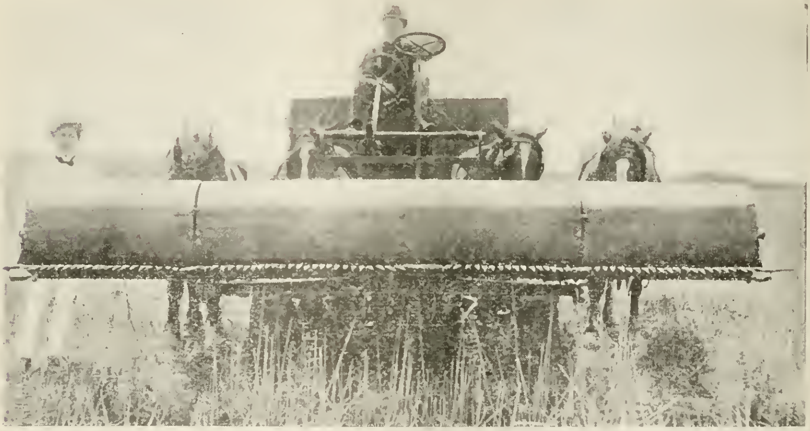
Fieldhouse: £15. (G. Newman.)

A New Type of Stripper.

H. ROSS, Chief Inspector.

A NEW invention of more than passing interest has lately been brought under the notice of this Department. It is a stripper from which all side draught has been eliminated. As will be seen from the illustrations, the machine is mounted on four wheels, the rear pair being mounted in such a way that they take the place of differential gears, that is to say, the machine when backed automatically releases all gears. The comb on the stripper is 14 feet wide. The machine is drawn by four horses, which it is claimed will average 2½ miles per hour. No pole is necessary, the horses pulling directly from the back axle and the machine is steered by independent gears from the fore carriage.

As previously mentioned, the cut is 14 feet wide on the pattern illustrated, and the stripped heads are conveyed from the beater drum by means of archimedian screws to the centre of the machine, whence by the same system they are conveyed to the bucket elevators delivering subsequently into the bin. The comb is arranged in such a way that the ends are detachable, thus allowing easy access through the usual farm gate, and also of alteration to suit crop conditions.

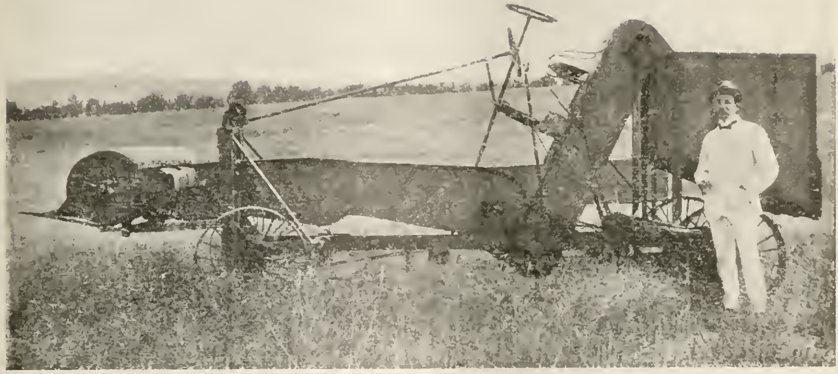


Front view, showing 14 ft. comb and also how the horses are arranged, thus eliminating side draught.

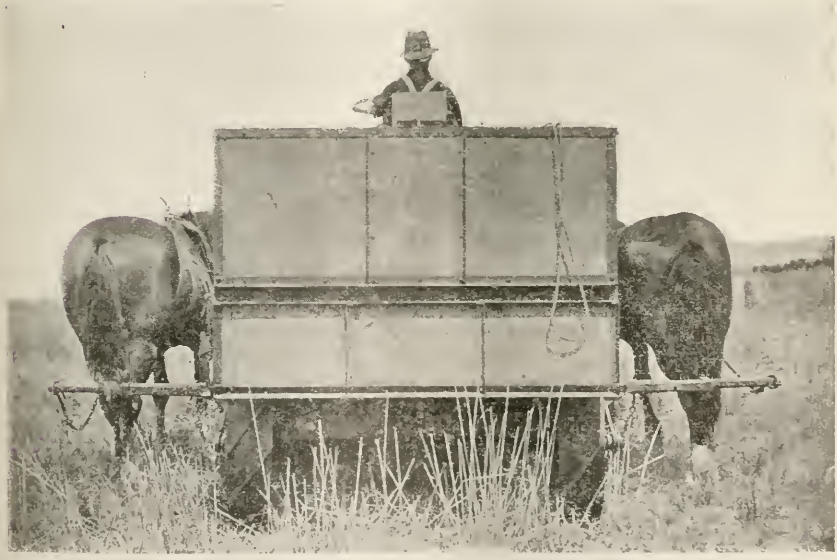
Trials have been held at the Condobolin Demonstration Farm, also at the Cowra Experiment Farm, and in the Bathurst district, and while these trials have not been entirely successful in every instance, this is more likely to be due to the necessarily experimental character of the machine rather than to its mechanical design.

The present machine was made in Sydney to the order of a company, of which Mr. W. F. de Brandt is secretary, and one of the patentees holding manufacturing rights of the stripper, while the basic principles of draught were patented originally by Mr. F. D. Fogarty, of Western Australia.

It is evident that the machine has great possibilities in reducing the time and labour cost in harvesting the crop as well as in reducing the risk of a loss in the crop occasioned by delay.



Side view, illustrating the general arrangement of the machine.



Rear view, showing equal distribution of weight on both rear wheels

A NEW TYPE OF STRIPPER.

Poultry Notes.

APRIL.

JAMES HADLINGTON, Poultry Expert.

No time should now be lost in getting the breeding pens made up for the coming season. The importance of penning the breeding stock early is greater than is generally realised by the average poultry farmer. When it is considered that in order to commence setting eggs from the first week in June (which is the advice always given in these notes) fertile eggs must be collected during the last week in May, it will be obvious that the 1st May is quite late enough to have the breeding birds settled in their pens. It is true that only a few days may elapse between the mating being completed and the possibility of fertile eggs, but it should be remembered that the hens are more likely to settle down to lay if allowed to get into their new quarters before the cold weather sets in. The great need of the poultry industry to-day is strong stock to breed from, and such can only be secured by greater attention to early hatching. It is to these early-hatched birds that every poultry-keeper should look for his breeding stock, and not those hatched late in the spring. September chickens may be first-class layers, but they are scarcely early enough to be used for breeding during the following year.

Pullets as Breeders.

One of the main causes for getting a late start in hatching is that many poultry-keepers depend almost solely upon aged hens for breeding. These do not usually lay many eggs before the end of July, which means that it is from the middle to the last week in August before chickens can be obtained from them, and then not many are obtainable that month. Therefore the bulk of the chickens obtained from hens in their second and third laying seasons are hatched in September, and are therefore too young to use as breeders early in the following season. Also, they, for the most part, lack the constitution of the stock hatched earlier.

The point it is especially wished to emphasise is that pullets hatched in June and July should be sufficiently matured the following June. The average egg production from pullets in their first year, in the months of May, June and July, is nearly double that of hens in their second year. This being the case, the advantage of breeding from first-year hens from the point of view of securing more eggs for setting is easily seen. The prejudice existing against breeding from hens in the first year, provided they are what they should be, is not well founded, and poultry-keepers who essay to breed early stock will do well to use them.

Mating.

The question is often asked—how many hens should be allowed to one male bird? This will vary according to the breed and conditions, but taken as a general rule, one male to ten or twelve females in light breeds, and one to eight or ten in heavy breeds, and less in either case if aged males are used, and more in the case of aged females and young males. It is not an uncommon thing for good results to be obtained with double that number of females, but this cannot be recommended as a general practice or for long periods. It might be mentioned that, except in rare instances, good results are not obtained from pairs and trios.

Flock Matings.

What are known as flock matings consist of penning a given number of hens with the complement of male birds, usually in the proportion of one to eight in heavy breeds, or one to ten in light breeds. This class of mating fills a certain place in rough breeding operations, that is to say, where pedigree breeding is not being attempted, and it mostly gives good results in chickens. There are some exceptions, but principally where an imperfect knowledge of the birds is possessed by the attendant. There are, however, one or two conditions essential to success. First, as an example, if 100 hens are to be penned with ten cockerels, more than that number of the latter should be put in at the outset—twelve to fourteen would be better. Some are sure to get beaten and become useless for service. This, then, will allow a sufficient number to be left to carry on the pen. Then again, in case the number of cockerels falls below the complement, and as the shortage cannot be replaced with other males without risk of the new birds being killed, the hens should be reduced to the proper proportions.

Rearing Ducklings.

The number of inquiries received as to the difficulties in rearing ducklings prompts some general advice on the subject. One of the commonest troubles met with by amateur duck rearers is that ducklings though apparently healthy, almost suddenly go down on their legs, roll on their backs, and many die. By some this is described as staggers; by others as taking fits; and by some the affection is attributed to some fell disease that has broken out. It is, however, nothing of the kind. This trouble is brought about by lack of knowledge, and the absence of simple precautions in regard to the water supply; in short, it is due to the ducklings having been deprived of water. It may only have been for a short time, but if food is taken while they are so deprived, and then they get water, the effect as described is the result. This is due to the peculiar anatomy of the duck, which is altogether different from that of fowls, inasmuch as the former possesses no crop in the sense that the chicken does. There is only the œsophagus widening somewhat at a point where the crop of the chicken is situated, and out of which there is only a small aperture into the gizzard. Liquids readily pass through this; but a small portion of food is sufficient to temporarily arrest the passage of water, with the result that when the ducklings drink heartily after partaking of food, unless it is very liquid (and which it will not do unless thirsty) distension of the œsophagus takes place. Pressure is then brought upon the vital organs in such a way as to cause the trouble referred to. Mature ducks are not affected to the same extent. This trouble should not be confused with sickness ; ducks that are sick will usually go down on their legs and also roll on their back, but in this case there are unmistakable symptoms of sickness previous to their getting to this stage. They will go off their food, perhaps, for days before they go down in the manner described.

The most prevalent disease among ducklings is what is known as "White eye." This disease is analogous to roup in fowls, and is very fatal. There is no known cure for it, and when it breaks out the best remedy is a drastic one. Kill and burn all infected birds ; they will not live in any case. Then give the ground a rest and a surface dressing of lime ; no ducks should be run on it for at least a year. The usual practice of putting permanganate of potash in the water is quite useless to effect a cure or even to prevent contagion.

THE USE OF GROUND WHEAT FOR POULTRY.

THE question was lately asked in the Chemist's Laboratory of the Department what amount of bran would have to be added to wheat-meal made from light weevily wheat to make a feeding mash for poultry, and trials were made with three different proportions of wheat-meal and bran. In view of the poor quality of much of the pollard on the market, and the large quantity of light wheat available, the results of these trials are opportune.

Where one part bran was mixed with two parts wheat-meal the mixture was somewhat coarse, but it made a good mash.

One part bran and three parts wheat-meal produced a good mash of better appearance.

One part bran and four parts wheat also produced a mash of good appearance, but when fed it seemed too adhesive for poultry.

Mr. J. Hadlington, Poultry Expert, recommended that the bran should first be scalded and then the other ingredients worked into it. Tests are being conducted at Hawkesbury Agricultural College to determine the quantity of the different grades that can be used under practical working conditions.

BERKSHIRE BOARS FOR SALE.

THE following Berkshire boars are for sale at the Women's Training Farm, Cowra :—

1 Boar, at 6 months.
2 Boars, at 5 ,,
4 " " 4 "
10 ,, ,, 8 weeks.

The price fixed is £2 2s. each at 8 weeks old, and 2s. 6d. per head per week additional as they grow older, f.o.r. Cowra. £1 is charged for a crate for one large pig or two small ones, which amount is refunded on return of crate. All inquiries should be addressed to

The MANAGER,
Women's Training Farm, Cowra.

Agricultural Bureau of New South Wales.

SINCE the commencement of this movement in 1911 highly satisfactory progress has been made, as will be observed on reference to the long list of country branches, and on perusal of the notes of meetings of the various branches published herein from time to time.

The main objects of this organisation are to impart agricultural education to farmers by means of lectures and demonstrations by departmental officers, and to encourage farmers to assist one another by gathering together regularly and exchanging their ideas and experiences, principally as regards local conditions, and, of course, regarding agriculture generally.

Farmers are invited to join the local branch, and can do so by getting into touch with its honorary secretary.

In districts where no branch exists, farmers are asked to co-operate with the Department in endeavouring to establish a branch. Full particulars regarding the usual method of procedure, &c., will be furnished on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Notice to Honorary Secretaries.

It is important that regular monthly meetings should be held, and that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*. Honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 14th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of the common insect pests of the district, and collections are cased as required. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Formation of Libraries.—It is suggested that each branch should arrange to establish a library for the use of members; it is thought that this would be a capital way of expending surplus funds.

Secretaries of any branches which may decide to form a complete library are invited to communicate with the Department in the matter, and they will be furnished with an appropriate list of standard works.

Each branch when formed is supplied with a set of available *Farmers' Bulletins,* and from time to time new bulletins are sent to the secretaries for addition to the files. In addition to this, individual members can also procure copies of any bulletin or publication that may be of interest to them in their particular branch of rural industry, by applying for the same through the secretary of the local branch.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Cattai.

A well-attended meeting of this branch was held on 20th February, the proceedings consisting of general business and a discussion on grasses. On 22nd February a party consisting of twenty-five members visited Hawkesbury Agricultural College, and spent a very interesting day, being cordially welcomed and entertained by the Principal.

Cordeaux-Goondarin.

A meeting of the above branch was held on 27th February, when arrangements were made for an exhibit of apples at the Wollongong show.

Cotta Walla.

The monthly meeting of this branch was held on 25th February, when Mr. S. Price read a paper on cultivation of pasture grasses.

Final arrangements were made for staging an exhibit at the Crookwell show.

French's Forest.

The branch held its annual meeting on 16th February, with a good attendance. All officers were re-elected, and an organising committee of four was appointed, two to represent the district, and two for the Soldiers' Settlement. It was decided that all returned soldiers be enrolled free of subscription. An increase in numbers is hoped for by members. It is desired, as soon as the balance-sheet is favourable, to form a library for the use of all.

Inverell.

At the annual meeting of this branch the election of officers resulted thus :—Chairman, Mr. G. H. Arkinstall; Vice-Chairmen, Messrs. J. Ditzell and A. E. Sweaney; Hon. Secretary, Mr. W. A. Kook; Auditor, Mr. E. C. Sommerlad.

The annual report showed that the year had been a profitable one, and a credit balance of £1 3s. was carried forward.

On 1st March a lecture was delivered by Mr. H. Wenholz, B.Sc. (Agr.), Inspector of Agriculture, as a feature of the Jubilee Show.

JUDGING AND SELECTING MAIZE.

Mr. Wenholz suggested, in opening, that the real object of an agricultural show was not winning prizes nor the exhibition of the biggest monstrosities the district could produce, but it was its educational value. Farmers should learn from the results obtained by other farmers the need for, and the means of, improving their farm crops, the comparative merits of new or improved varieties or strains, and where to obtain good seed. The proper classification of exhibits was essential, not only to the educational value of the show, but also to successful judging. In that day's show the classification in the maize section was the best possible, viz., ears for seed and shelled grain for market. This classification had only this year been adopted by the Royal Agricultural Society.

In judging seed ears there were two factors to be kept in mind—yield and quality. The prize should be awarded to the exhibit of ears which in the opinion of the judge would produce the largest yield of the best quality. This could only be done by a study or consideration of the visible characters associated or correlated with yield and quality. The successful dairyman in selecting a dairy cow knew that there were certain points, such as a long thin tail, prominent milk veins, and a certain type of body and head, which indicated good milking capacity. So, too, with maize there were certain visible characters in the ears which indicated good yielding capacity and good quality.

The first point to consider was the length of the ears. In a district such as Inverell, where the growing period was much shorter than on the coast, and where large-eared, late-maturing varieties could not be grown, the length of the ears should not exceed a certain standard, which differed somewhat with the variety. It was important to credit an exhibit with full points for length of ears if the variety standard was reached, rather than to indiscriminately give the full scale to the largest ears.

Ears of cylindrical shape, with almost the same circumference from butt to tip, showed good robust constitution, and indicated good yielding ability, while tapering ears not only gave a lower shelling percentage, but less uniform grain, since that nearing the tip became smaller and narrower.

The exhibit of ears should also be true to the type they were supposed to represent, just as a certain type was insisted on in defined breeds of stock. Much greater attention should be paid to the uniformity of the exhibit. The ears should be uniform in size, shape, appearance, character of the dent (*i.e.*, its roughness or smoothness), and in the colour of the core. There was considerable room for improvement in uniformity, because it meant greater uniformity in maturing, and, therefore, more uniformity in flowering (*i.e.*, tasselling and silking). Greater uniformity in flowering meant fewer barren stalks, fewer nubbins, and less imperfect filling of the ear—the result of better fertilisation.

There should not be too wide a furrow between the rows of grain on the cob, nor should a large space exist between the tips of the grain on the cob.

Length of grain was not so important in that district, where an early variety had to be grown. One of the best yielding varieties for this locality (Funk's Yellow Dent) did not have deep grain, but it made up for this in other characters, such as thickness, weight, &c. Some of the varieties exhibited had deep grain of poor quality, and lacked the most important character—weight. The grain should be of good bright colour, and should also be uniform. Mixed colour on the cob, or even white-capped yellow grains, were objectionable. The best grain had a slight wedge shape, that being superior to rounded, square, or pointed grain.

The butts of the cobs should be well rounded, and covered with grain, leaving a deep depression when the shank was removed.

The best tips were those which had uniform regular grain of good size as far out as possible. This was more important than small irregular grain extending right over the tip of the cob.

The grain should be dry, sound, and firm on the cob. The proportion of shelled grain per ear should be high. Ears ranged from 70 to 88 or 90 lb. of grain for 100 lb. of ears. A high shelling percentage was affected chiefly by size, woodiness of core, maturity, space between rows and grain, and shape of ear.

In judging shelled maize there were at least thirteen different points to be considered which affected the market value of the grain.

In the first place, it was well known that the largest grain was in most demand on the market. The size of the grain was limited in this district, however, by the fact that early varieties were essential and they did not as a rule have large grain.

Narrow, pointed grain was not in favour, as it was usually regarded as of poor feeding value.

Thick grain was demanded by millers and cornflour manufacturers, as it meant to them less bran and waste.

The grain should be of uniform colour, as mixed colour was sometimes cut as much as 3d. per bushel.

Yellow maize usually sold better than red or white maize, though there were times when the cornflour millers were operating on the market, and the value of white maize equalled that of yellow.

The weight per bushel was a factor, as buyers liked a heavy maize. This was usually gauged by rough estimation of a handful of grain.

Feeding value was largely indicated by the amount of gluten and endosperm. Varieties containing a large amount of soft starch were regarded as of poor feeding quality.

Dryness was an important feature. Buyers would not pay for excess of moisture in the grain, which also decreased the keeping quality, owing to the danger of mould. Thoroughly dry maize should give a sharp rattle when falling on a hard surface.

Maize should be sweet, *i.e.*, free from any trace of musty or other odour. It should also be free from insect or mice injury, or from any fungus disease.

Plumpness was a most desirable character, and was usually indicated by a full tip, with freedom from wrinkling on the back or on the germ of the grain. The sample should be clean, *i.e.*, free from bits of cob, foreign matter, dirt, and from chaff adhering to the tip of the grain. The grain should also be of good, bright, healthy appearance. Grain without brightness or lustre was not in favour.

Maize with these characters of good quality was sometimes bought on the market by seedsmen at an advance of 1s. or more per bushel. These seedsmen then graded the maize, and sold it as seed maize.

The committee of the show was to be congratulated on its forward move in giving prizes for recognised specific varieties of maize. This had been done by the Royal Agricultural Society last year, and was of great value in the encouragement of good yielding varieties suited to particular districts.

The score card should be introduced for judging maize. It was of real educational value to the grower, and even to the judge, in setting forth the essential points to be observed in selection and judging, and in showing the relative value of these points. By showing the score card alongside each exhibit the exhibit could be made still more educative.

Kellyville.

A meeting of this branch was held on 2nd March. The Secretary reported that the branch's exhibit was awarded first prize at the Castle Hill show. The exhibit was auctioned for patriotic purposes, the proceeds being voted to the Kellyville Boys' Comfort Fund.

Kyogle.

At a meeting of this branch on 2nd February there was a fair attendance, over which Mr. J. J. Heffernan (Chairman) presided.

Mr. Dunlop intimated that he was unable to continue the duties of Secretary, and Mr. Jas. Martin was elected in his stead.

The business before the meeting was a couple of addresses on the principal diseases of calves.

DISEASES OF CALVES.

Mr. G. **FLEMING** said that with the high prices and scarcity of stock it was to their advantage, and more than ever their duty, to adopt the best methods of combating diseases in calves. In the past, when it paid better to raise pigs, they did not give so much attention to calf-raising, but the conditions had changed.

The first thing was to make proper provision for the calves when they were born. There should be suitable paddocks (two at the very least) of an area suitable to the size of the herd. In these paddocks there should be proper shade from the sun and shelter from the rain, and, if possible, a good supply of water, a running stream being preferable. To keep calves tied up as some did was very detrimental. They wanted exercise, and would get it if allowed to roam in the small paddock, but they should be kept there for a month following their birth. For a similar period they should be fed with new milk;

no separated milk should be given. It was not good to give them skim-milk during the first three or four days. After that they could be allowed to run loose in the small paddock. They should be kept there for a month or six weeks, and then put in the larger paddock, when they would be no trouble. In about a month's time blood-scours would begin to become manifest. This disease had killed dozens. He had tried all remedies, but until last year had not found anything effective until he tried ordinary salt. A teaspoonful of that had very good results. Last year he had fifty calves and reared forty-nine of them, and blood-scours was very prevalent throughout the district. This year he had forty calves, and every one got the disease, but he had not lost any. Calves contracted the disease when about three weeks to a month old, but he had cured every calf by dosing it twice a week with salt. His method was to put a teaspoonful of salt in a gallon of milk, and to place it in the calves' paddock in proper shelter. He guaranteed the treatment to cure, except when the trouble had gone too far; then nothing would cure. He had tried various foods, but found that a diet of skim milk was the best. The winter cold was not good for calves, and proper shelter should be provided for them. There should also be a lucerne patch or crop of oats to make into hay for feed. They made better fodder than one could buy, and not nearly so expensive. The poddies should be provided with fodder grown on the farm.

The calves' paddock should be spelled at times, to enable it to get a good coat of grass. His calves had become so accustomed to the paddock that when he fed them at night they went in of their own accord. Concluding, Mr. Fleming said there must be proper shelter for calves from the heat of the sun, from rain, and from cold changes in the weather. Milk should be fed to poddies at the right temperature, and for this purpose he thought every dairy should have a steam boiler.

Mr. L. **Devlin**, Inspector of Stock at Casino, said there was only one proper method of feeding calves, and that was from the mother's teat. The next best thing was to get as near nature as possible. This was possible per medium of india-rubber teats. This was the only method by which calves could be reared without trouble. It meant a good deal of extra work, but with the better calves reared it was worth while. He knew a dozen places where these appliances had been in use for years, and the results were very satisfactory. If the milk was taken naturally it mixed with the saliva, and this helped the animal to digest it. He was against the principle of feeding from pipes or a drain. Under these conditions calves took the food in gulps, and it was apt to lie in great lumps of curd in the stomach. The digestive organs were very delicate, and he did not wonder at troubles occurring when the calves were fed from drains. If they adopted teat feeding they would do away with blood-scours almost immediately. There was another aspect of drain-feeding. Milk was one of the best media for the cultivation of microbes, and if it went through a pipe certain matter was deposited which could not be got rid of, and this developed injurious organisms, which immediately caused trouble, and blood-scours were the result. There was not so much danger with bucket-feeding. The calf got just as much as was necessary, and the buckets could be scalded. If the milk was run through a drain one calf would get too much and another not enough. Scours were caused by undigested food setting up inflammation in the stomach, which spread right along the bowels. He agreed with Mr. Fleming regarding manufactured foods, and also with regard to the provision of paddocks for the calves.

If rubber teats were used they must be properly washed, for otherwise they would be worse than the drains. They should be washed thoroughly after use and then put in lime-water, which preserved the rubber and also had a cleansing effect. The next best method was feeding out of buckets, which could easily be scalded. He advised tin buckets in preference to galvanized iron, as the latter oxidised, and the oxide of zinc thus formed was an irritant. Cow's milk contained something which could not be replaced, and this was particularly true of new milk. These properties cured digestive derangements. Calves should be fed wholly with this for the first fortnight, and subsequently the quantity of separated milk should be gradually increased until it was half and half, and a week should elapse before the calves were wholly fed with separated milk. If they did this they would find the disease diminish. On the other hand, calves might get the disease from chills. Salt was a most excellent thing, and the quantity recommended by Mr. Fleming was the same as he himself would have suggested. Moreover calves usually did not get sufficient lime. A teaspoonful of lime-water would have a good effect; being an alkali it helped to neutralise acids, and these acids were one of the causes of blood-scours. The method he suggested was to place a quantity of lime in a bucket, and after putting water in it to stir it up well. Then let it rest until the lime settled and a clear fluid remained; put the fluid in the milk. The lime could be used over and over again, and should be given to the calves twice a week.

Referring to white scour, Mr. Devlin said the cause was an organism which, after much investigation, had been isolated by Professor Nokard, of the Pasteur Institute, Paris. This organism entered the calf by the navel cord. The best preventive, therefore, was to tie the navel cord and treat it with a disinfectant. The best disinfectant was formalin, and the quantities were very simple. When scour was noticed they should give lime-water and salt, and that would probably be sufficient; if not, a spoonful of formalin in a pint of boiled water, and then one teaspoonful of this diluted mixture added to a pint of milk that had not been separated, and about two tablespoonsful of raw linseed oil was good for the animals up to about six months old. Castor oil had an irritating effect; hence linseed oil was recommended. If that had not the desired effect, add half an ounce of tincture of opium, or up to about an ounce for calves up to six months old. However, the trouble would largely disappear if the calves were fed through rubber teats.

Regarding redwater complaint, which Mr. Devlin said had nothing to do with tick fever, he found if taken in time it could be cured. The cause was first grit and dirt in the feed, second malnutrition, third drinking stagnant water, and fourth insufficient shelter. One of the symptoms always present was the grinding of the teeth, and that, together with the passing of red water was a sure indication of the complaint. The farmer should mix up a diluted solution of permanganate of potash, and, in addition, a half drachm to a drachm of tincture of iron. One to one and a half teaspoonsful of this mixture should be given once a day. The mixture should be boiled until it was in a syrupy condition. In the case of older calves, omit the permanganate of potash and add five to seven drops of aconite.

Lidcombe.

A meeting of the above branch was held on 14th January. Mr. Lunney lectured on the making and maintaining of a flower garden. He dealt mainly with the making of a garden, drainage, hedges, lawns, paths, &c. Each point was dealt with and an interesting evening was spent.

On 28th January there was a good attendance of members to listen to a lecture on the propagation of plants by the Secretary, Mr. A. E. J. Anderson, who dealt with seed germination, layering, division and separation, but owing to the lateness of the hour the subjects of cutting and grafting had to be held over till a later date, when Mr. Anderson has promised to finish his lecture.

This took place on 25th February, when there was an attendance of thirty-seven members, besides visitors, all of whom appreciated Mr. Anderson's advice.

An exhibit comprising apples, tomatoes, potatoes, pumpkins, &c., was staged. The idea of the exhibit was simply to bring under the notice of residents the variety of the crops that is grown in the district. A secondary object was to arouse interest in the work of the branch. Keen interest was shown in the exhibit, and many people were genuinely astonished at the variety of the produce of the district.

The Secretary advises that it is proposed to have a similar exhibition about every three months.

Matcham.

At a meeting of this branch on 23rd February, a paper was read by Mr. A. Macinante, of which a condensation follows:—

How to Grow Cabbages.

The main thing in growing cabbages is to keep them healthy and in vigorous growth from start to finish, for if checked by drought, insect pests, or poverty of soil the results are sure to be disappointing. The quicker any vegetable is grown the more tender and better flavoured it will be, and the less the danger of drought, insect pests, &c. How to accelerate their growth is the point.

In this district the majority of growers start to plant cabbage in February and continue till July. During this period we have usually plenty of moisture in the ground for the requirements of the cabbage, and it remains with us to find out which sort of concentrated plant food is best adapted to accelerating the growth. There is no doubt that either well decayed stable manure or blood and bone is essential, but adding a quick acting nitrogenous fertiliser as a top dressing at the proper time will assure a luxuriant crop, provided weeds, insect pests, &c., are kept down. For a few years I have been using sulphate of ammonia; it acts very quickly and is good if one has plenty of lime in the soil, but otherwise nitrate of soda seems the best. Last year I tried three experimental plots, each 120 Succession cabbage plants. These were planted 2½ feet between the rows, and 2 feet from plant to plant. All three plots were treated with blood and bone in the drills before planting, and when the plants were well established and putting on growth, I gave the first plot a top-dressing, spreading round each plant about 1½ oz. nitrate of soda, keeping it nearly 4 inches from the stem, and mixing it with the soil with a rake. The second and third plots were only worked at this time. When the cabbages showed signs of folding in I treated the first plot with the same quantity of nitrate of soda as before, but instead of spreading it round the plants I spread it on the space between the plants and then hilled them up. The second plot was treated in the same way, but, instead of nitrate of soda it was a liberal dressing of blood and bone that was used. The third plot was only worked, hilled and kept clean. It is always wise to give the top-dressings when there is a probability of a shower, or after one, provided the ground is not too wet. The first plot gave the best results ; the cabbages put up a great growth, the leaves expanding wonderfully and coming to beautifully formed heads ten days before the others. They were more tender, and not so strong in taste as were those grown under different treatments. Some specimens weighed up to 20 lb., while the average was about 14 lb. ; from the other plots none went more than 8 lb.

The fertiliser used on the first plot cost altogether 8s., made up of 2s. for 22 lb. of blood and bone and 3s. each for two dressings with nitrate of soda. The return consisted of ten dozen cabbages, sold at 5s. per dozen.

On the second plot the expenditure on fertilisers was 4s., each of the dressings of blood and bone, 22 lb., costing 2s. The return consisted of 10 dozen cabbages sold at 3s. per dozen.

The third plot cost 1s. 6d. for fertilisers, only 18 lb. of blood and bone being applied at the time of planting. The ten dozen cabbages sold brought only 12s. 6d. altogether.

Moss Vale.

A well-attended meeting of the above branch was held on 25th January, when an interesting lecture was delivered by Mr. L. T. Badgery on dairy farming.

A competition for exhibits from branches of the Agricultural Bureau was a feature of the recent Moss Vale show. Three branches competed with exhibits of dairy produce, fresh and preserved fruits, jams, jellies, &c., also wheat, maize, barley, oats, vegetable and other seeds, hay, chaff, ensilage, grasses, &c.

The result of the judging was as follows:—Moss Vale, 382¼ points, 1 ; Mittagong, 364½ points, 2 ; Yarrunga and Avoca, 287½ points, 3.

A trophy, in the form of a silver shield, has been presented by Mr. O. Phillips (a member of the Moss Vale branch) for the competition, the condition being that it is to become the property of the branch that wins it three times. Moss Vale, therefore, holds the shield for the first year.

DEPARTMENTAL NOTE.—A valuable competition has been made possible by Mr. Phillips' gift, and the branches in the vicinity cannot but feel its encouraging and stimulating effect in the future. The history of the shield will be watched with interest by all members of the Bureau.

Orangeville.

A meeting of the above branch was held on 23rd February, the business being of a general character.

Orchard Hills.

A well-attended meeting of the above branch was held on 24th February, when, after general business, a discussion took place on the spraying of grape vines. Several members gave their experiences of the last twelve months. Most of those present had found that Bordeaux mixture was the most effective spray to use for Black Spot.

Quaker's Hill.

There was a good attendance of members at the meeting held on 9th February. One new member was enrolled.

The evening was most devoted to a general discussion on different phases of agriculture, poultry, &c. The matter of a breakwind crops up often, and the Osage orange seems to be in favour locally for the purpose, especially as the Department has practically decided against the two kinds which formerly mostly interested members, viz., olives and almonds.

It was decided to accept the offer of the Blacktown branch to co-operate in the organisation of an exhibit at the Blacktown show in April. Resolutions were carried to the effect that the exhibit be confined to the Blacktown district only, and that it be held at a later and more suitable date for the products of the district. A committee consisting of representative gentlemen was set up to arrange the matter, and put it on a sound footing.

The monthly meeting took place on 2nd March. After the formal business was put through, Mr. Tanner delivered a lecture on cattle raising and breeding.

Spencer.

A meeting of the above branch was held on 23rd February, when an article in the *Agricultural Gazette* on potato growing was discussed and other general business transacted.

Springside.

A meeting of the Springside branch of the Bureau was held on 26th February, the proceedings being occupied with general business.

St. John's Park.

A well-attended meeting of the above branch was held on 22nd February, when an interesting lecture was delivered by Mr. Ramsay on the soils of the district.

Tallawang.

The usual monthly meeting of this branch was held on 2nd March, when a discussion took place with regard to the question of chondrometers.

Tennyson (North Richmond).

At the last monthly meeting on 2nd February there was a good attendance. Four new members were elected, making the total membership seventy-two.

The principal business of the evening was a discussion on the report of the committee appointed to consider the co-operative scheme, as proposed by Mr. J. Hann. The point about which most interest was shown was the first clause of the scheme as recommended by the committee—"That the Tennyson branch of the Agricultural Bureau take steps to form a co-operative society for disposal of all products from the Kurrajong district."

All who spoke agreed that the present system of handing fruit over to a commission agent was unsatisfactory, and open to fraud, but the difficulty seemed to be to find a man who had the business capacity to sell the produce to the best advantage, and who also had the full confidence of all members.

A vote on the first clause was taken by ballot and it was carried unanimously. The remaining three clauses—"That a competent salesman be appointed," "That the price be left to supply and demand," "That proceeds of sales be banked in the name of the Association"—which are really only machinery clauses, were also carried. It was decided that a meeting of pea-growers be called at a convenient date, as it was thought advisable to start with the next pea crop.

The branch decided to compete in the section for exhibits from branches of the Bureau at the next Hawkesbury show.

Windsor.

A branch has been formed at Windsor, in the Hawkesbury District. Office-bearers have been appointed as follows:—Mr. Albert Hannabus, Chairman; Mr. Claude Farlow, Vice-Chairman; Mr. W. H. Spinks, Secretary and Treasurer. The subscription has been fixed at 2s. 6d. per year, and the number of members on the books is already twenty-six. The Hon. Secretary states that it is anticipated a very strong branch will be in operation in a few months.

Wolseley Park.

A meeting of the Wolseley branch was held on 9th February, the time being taken up with general business and a discussion on the weed St. John's wort.

Woonona.

A well-attended meeting of this branch was held on 12th February, when Mr. Gahan gave a practical demonstration budding and grafting, and Mr. Geo. Fowler read a newspaper article on the Rhode Island Red breed of fowl.

At the annual show held by this branch, the members granted permission to the Red Cross Committee to have a refreshment stall in the hall, with the result that the Red Cross benefited to the extent of £8 17s. The eggs which were on show—about eight and a half dozen—were afterwards given to the Bulli Cottage Hospital.

Orchard Notes.

APRIL.

W. J. ALLEN.

Harvesting.

THE bulk of the late varieties of apples and pears in our tableland and inland districts are harvested this month. Generally speaking, these late varieties have good keeping qualities, and if prices are not satisfactory at the time of picking it would be well for growers to hold the top grades and only market the poorer quality that it would be unsafe to store. In our cooler districts, and even in the warmer districts now that the autumn is approaching, the weather is cool and the better keeping apples, such as Granny Smith and Stone Pippin, will keep for some time in ordinary storage. But for pears and for apples intended for long storing, cool storage is the safer plan. Fruit for storage in any way should only be picked when cool, and every care should be taken to keep it cool. The picking cases as they are filled should be kept on the shady side of the tree till collected and taken to the packing house. There the fruit should be sorted carefully, and all bruised or damaged specimens excluded, for not only would they fail to keep, but they would start decay in sound specimens with which they came in contact. Strict sorting is one of the essentials of successful storage.

For ordinary storage there is no doubt the fruit holds better when wrapped, but this makes the inspection before marketing more troublesome, and good results can be obtained by lining the cases well with paper and putting the apples in loose. The lining prevents a too free circulation of air and consequent shrivelling of the fruit. The fruit can then be more easily inspected, the rejects thrown out, and the others wrapped and packed when the case is to be placed on the market.

Fruit for cool store, as stated before, should be picked when cool and be carefully sorted, wrapped and packed, and got into store as soon as possible. From the time of picking till arrival in store it should be kept as cool as possible. Delay in carriage of fruit to or from or on the rail during bright, sunny days will cause the consignment to become warmed up and will shorten the period over which it can be kept.

Wrapping.

With the increase in the price of paper it becomes questionable whether it pays to wrap fruit for the local market. We know of instances where Williams pears unwrapped have realised the same prices as the same grade of Williams wrapped. It must be remembered, however, that it is quite possible to pack Williams "naked" without stalk injury ensuing, whereas with some varieties of pears and most apples packing without wrapping causes more or less of stalk injury to the fruit, which must tend to lower its value on the market. By wrapping, stalk injury can be practically eliminated.

Green Manuring.

If green manure crops are not already sown, this work should be done without delay, otherwise sufficient growth will not be made before it is time to plough the crop under in the latter part of the winter. To give it a good start it should be sown with a commercial fertiliser.

Manuring and Liming.

Any available farmyard manure should be carted out and spread amongst the trees. The application of bush scrapings and soil should be made to citrus trees, as time and weather will allow.

The present season is a good time to give an application of lime to sour or heavy and sticky soils. From 5 to 10 cwt. of agricultural lime is a satisfactory dressing.

Planting.

The planting of citrus trees may be continued this month in districts free from frosts. Care should be taken when planting not to allow the roots to become dry by exposure to either the sun or wind. If it is intended to plant out any new areas with deciduous fruits, the land should be cleared and subsoiled as soon as possible, if that has not already been done. There should be no delay in ordering trees from the nursery, and stipulations should accompany the orders that the trees shall be worked on stocks suitable for the district, and especially that all apples shall be on blight-proof stock. Where refills are to be planted in established orchards, it is a good plan to remove a load or two of the old soil and fill in with fresh soil.

Citrus Scale.

If the trees are in good condition it is not too late to fumigate or spray them this month. The dead scale will still have time to crack off the growing fruit before it is fit for market, whereas if the treatment is delayed the fruit will appear scaly, although the insects may be dead, and will not be allowed to enter the New Zealand or interstate markets. Fumigation tables and a bulletin on spraying may be obtained on application to the Department.

Cultivation.

In some districts where it is important to catch and store all the autumn and early winter rain, and where cover crops have not been sown, it is a good plan to plough the orchard now, otherwise it is well to let the land rest until the winter ploughing, when all the weeds that have grown can be turned under to help in keeping up the humus content of the soil.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
Blayney A. and P. Association	Black & Co.	April 10
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 10-13
Clarence P. and A. Society (Grafton)	G. N. Small	,, 16, 17, 18
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 17, 18
Bathurst A., H., and P. Association	S. V. Turrell	,, 17, 18, 19
Batlow Agricultural Society	C. S. Gregory	,, 23, 24
Dungog A. and H. Association	W. H. Green	,, 24, 25, 26
Orange A. and P. Association	W. J. I. Nancarrow	,, 24, 25, 26
Wellington P., A., and H. Society	A. E. Rotton	,, 30, May 1
Dubbo P., A., and H. Association	F. Weston	May 8, 9
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 9, 10, 11
Nyngan and District P. and A. Association	E. Costelloe	,, 22, 23
National A. and I. Assn. of Queensland (Brisbane)	J. Bain	Aug. 12–17
Trundle P. and A. Association	W. E. Herborn	,, 13, 14
Corowa P., A., and H. Society	J. D. Fraser	,, 20, 21
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 27, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 3, 4
Grenfell P., A., and H. Association	G. Cousins	,, 3, 4
Ganmain A. and P. Association	T. S. Henderson	,, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson	,, 10, 11, 12
Young P. and A. Association	T. A. Tester	,, 10, 11, 12
Cowra P., A., and H. Association	E. W. Warren	,, 17, 18
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 17, 18
Temora P., A., H., and I. Association	A. D. Ness	,, 17, 18, 19
Holbrook P., A., and H. Society	J. S. Stewart	,, 19, 20
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25
Yass P. and A. Association	E. A. Hickey	,, 26, 27
Ardlethan and District P. and A. Society	W. J. Nixon	Oct. 2
Hay P. and A. Association	G. S. Camden	,, 9, 10

1919.

Southern New England P. and A. Association (Uralla)	H. W. Vincent	Feb. 25, 26, 27
P. and A. Assn. of Central New England (Glen Innes)	G. A. Priest	Mar. 11, 12, 13

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1918.

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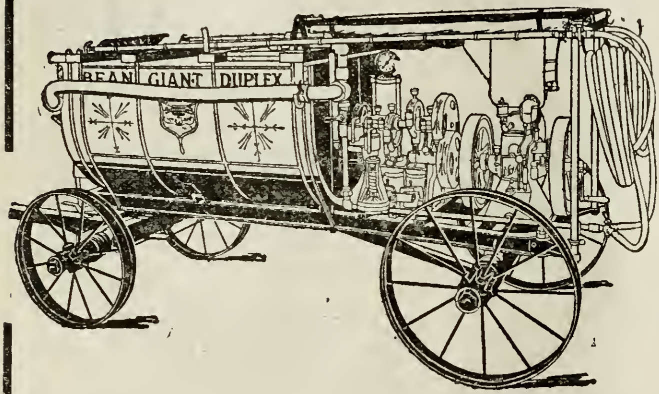

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2nd May, 1918.

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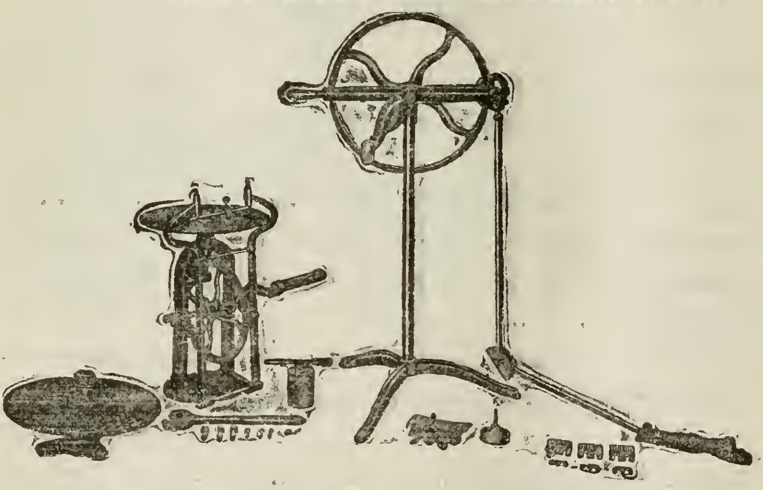

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VOL. XXIX. PART 5. MAY 2, 1918

Agricultural Gazette of New South Wales.

Water on the Farm.

[Continued from page 231.]

F. B. GUTHRIE.

WATER FOR HUMAN CONSUMPTION.

In judging of the suitability of a water for drinking purposes, other factors must be considered than in the cases hitherto dealt with. Although, as a general principle, it may be laid down that the purest water is the most suitable for drinking purposes, a certain proportion of saline matter, and particularly of lime-salts, is quite unobjectionable, and, indeed, beneficial.

Rain-water.

Rain-water, being the purest form of water occurring naturally, is consequently entirely suitable, and forms one of the best and most convenient sources of supply in country districts, provided that the tanks and gutterings are kept secure from contamination, and that the metal of which they are composed is not attacked. Nearly all water stored in galvanized iron tanks contains a small proportion of zinc. This quantity is exceedingly minute, and as zinc is not a cumulative poison there is little or no risk to be feared from the use of such water; and, as far as I am aware, there are no authenticated cases of poisoning from rain-water stored in galvanised iron tanks. Any possible risk can be readily avoided by painting the inside of the tank, and any pipes or taps which come in contact with the water (such as the inlet-pipe, outside and inside) with a good asphaltum paint. The Water and Sewerage Board use red-lead paint for this purpose.

The case of metallic lead is different, and on no account should leaden vessels, pipes, or taps be used in contact with rain-water, as rain-water readily attacks lead, and lead is particularly objectionable, even in small quantities. Lead is a cumulative poison—that is, it is not readily ejected from the system, and repeated small doses will gradually accumulate and form a poisonous one. These objections do not apply in the case of red-lead paint referred to above: water has no action on this.

When the above sources of danger are eliminated—that is, contamination from outside or from the metals of pipes or reservoirs—freshly-fallen rain-water in country districts is an ideal water for drinking purposes. When, however, rain-water has been stored for any length of time, and particularly when the tanks are not periodically cleaned out, it frequently develops moulds and organisms which give rise to objectionable odours, and such contaminated water may produce serious disorders.

To ensure a safe supply of rain-water for drinking purposes, the tanks, if of metal, should be coated inside with a bituminous paint, or with red-lead paint. The inlet pipe should be similarly protected, both outside and inside, as it is in actual contact with the water when the tank is full. The tanks should be emptied and cleaned out periodically. They should be covered, and where the rain enters from the gutters it should be strained through a fine-mesh wire strainer, which can be easily removed and cleaned. A number of such strainers placed in different parts of the gutter will serve to prevent undue collection of débris, &c., at any one point. It must also be borne in mind that after a dry spell the first water collected from roofs and gutterings is nearly always badly contaminated, and this water should not be allowed to run into the tanks. There are mechanical devices in the market for dealing with such water, but in any case the pipe feeding the tanks should be so fixed that this water can be diverted until the roofs and gutters have been flushed.

General Characteristics of Water for Drinking Purposes.

Saline Matter.—Whether obtained from running streams or rivers, or from springs or wells, all water, as we have seen, contains a certain amount of saline matter in solution, which is occasionally quite considerable. With regard to the nature of these salts and the amount that is likely to be injurious, there is always the safeguard that any excessive quantity will betray itself to the taste. The salts that we have seen are likely to be present are not actually toxic to the system as they are to plants, and it is only very rarely that poisonous metals are found. Salts like common salt or alkali, if in any quantity, betray themselves by their brackish or mawkish taste, and any ill-effects which they may produce will only slowly manifest themselves. Seventy parts of common salt per 100,000 (42·5 parts chlorine) renders water distinctly brackish. In the cases of waters mineralised with sulphate of magnesia, the bitter taste will provide ample warning. The only danger to be apprehended from the use of such waters is due to their purgative properties.

Unfortunately, the palate is not an entirely safe guide in the choice of a drinking-water, because although saline matter and excessive organic contamination can be readily detected, the presence of pathogenic organisms does not reveal itself to the taste.

Diseases such as cholera and typhoid are carried by water which is quite tasteless. On this account it is of the first importance to ascertain the amount, and particularly the nature and origin, of the organic matter present.

Organic Matter.—When the source of supply is from standing water, as from ponds or wells, especially in the neighbourhood of human habitations or of stables, the water should always be referred for analysis, and this also applies to the water of streams or rivers which run past dwellings or stables.

Water from shallow wells in such circumstance is always to be suspected, as the risk of sewage contamination is considerable.

Fortunately for us, influences are constantly at work in both the above cases which tend to remove or reduce the danger. In the case of wells, even of shallow wells, the surrounding soil acts to some extent as a filtering medium to remove introduced organisms; in the case of rivers, the flow of water produces a gradual purification by aeration and precipitation. Such water, or indeed any untried water, should, however, never be used as a supply for drinking purposes without a preliminary analysis.

A properly-conducted bacteriological and chemical examination of the water will indicate any possible sewage contamination, which is the most serious danger to be faced.

Analytical Data.—As far as the chemical analysis of the water is concerned, it is fairly well established that the presence of "free ammonia," "albuminoid ammonia," and of nitrites and nitrates in any quantity are indications of organic contamination, as these substances are only present in very minute quantities in pure water, and are not introduced by the material composing rocks, but are due to the decomposition of organic matter. The presence of chlorides in excessive amount in running water or water from shallow wells is also suspicious; but such indication does not apply to the deeper well-waters, which, as we have seen, are often very highly charged with common salt in circumstances which preclude any possibility of organic contamination.

Oxygen consumed.—Another indication of contamination or, rather, of the amount of organic matter present, is afforded by the quantity of "oxygen consumed." This is a laboratory method, by which the carbonaceous organic matter is determined by the amount of oxygen required to oxidise it. It affords no indication as to the origin of the organic matter, whether due to vegetable or animal contamination.

In order to form an opinion as to the suitability of any water for human consumption, it is necessary to know something of the kind of water—whether spring or well water, whether shallow or deep—and of its surroundings, to supplement the information supplied by bacteriological and chemical analysis.

Interpretation of Analyses and Standards.

It must, therefore, be understood that there are no absolute standards which can be definitely fixed to determine the purity or otherwise of any water, or its fitness for drinking purposes. We can only say, in a general way, that if certain impurities are present in more than certain proportions, there is ground for suspicion of previous contamination.

Speaking generally, and with the foregoing reservation, the following table represents approximately the limits beyond which such indications of organic contamination must be regarded with suspicion.

COMPOSITION of Normal Water.

	Parts per 100,000.		Parts per 100,000.
Free ammonia ...	Nil to 0·013	Nitrogen as nitrites	Nil to 0·0006
Albuminoid ammonia	0·002 to 0·03	Oxygen consumed	0·06 to 0·40
Nitrogen as nitrates	Nil to 0·025		

The following figures, published by A. R. Leeds, Water Department, Wilmington, U.S.A., represent the standard established by him for American rivers, and are taken from "Examination of Water," by W. P. Mason:—

	Parts per 100,000.
Free ammonia	0·012
Albuminoid ammonia	0·028
Nitrates	0·389
Nitrites	0·0003
Oxygen consumed	0·70

The above figures are only given for the benefit of those who are unfamiliar with water analysis, in order to give some indication of the kind of analytical figures to be expected for the different ingredients in safe waters.

If figures higher than those above given are obtained it becomes of importance to ascertain the origin and surroundings of the water supply, and particularly whether the excess of organic matter thus indicated is due to possible sewage contamination, and possibly to have a bacteriological examination conducted.

The following few notes will indicate to what extent previous sewage contamination may affect the quantities of the ingredients referred to.

The following is the composition (Thresh, "Examination of Waters and Water Supplies") of samples of crude sewage, a good effluent, and of peaty water:—

	Parts per 100,000.			
	Crude Sewage.	Effluent.	Peaty Water.	Infusion of Dead Leaves.
Nitric nitrogen (nitrates)	...	2·9	...	...
Free ammonia	5·9	1·5	0·001	0·003
Albuminoid ammonia...	2·2	0·05	0·024	0·031
Oxygen absorbed	5·9	1·01	0·19	0·814

These figures supply a rough idea of the nature of animal and vegetable contamination, respectively.

In the first instance the quantities of free and albuminoid ammonia are enormous in both the sewage and the effluent, and the proportion of free ammonia to albuminoid ammonia is about 2½ to 1 in the sewage and 30 to 1 in the case of the effluent. A water yielding more free ammonia than albuminoid is therefore suspect of contamination by organic matter of animal origin; water contaminated by vegetable matter, on the other hand, contains more albuminoid ammonia than free ammonia. The presence of nitrates (nitric nitrogen in the above table) in any quantity is generally recognised as due to the oxidation of nitrogenous organic matter of animal origin. It will be seen that it is absent in crude sewage, but is rapidly formed as soon as the sewage decomposes or is artificially oxidised. It has been noted that very small quantities of nitrates are found in the purest rain-water, and, consequently, in all natural waters which are derived from rain-water. These are probably due to the oxidation of atmospheric nitrogen by lightning, but this quantity is very small (see Tables, *Agricultural Gazette*, November, 1917, pp. 762 and 763). Vegetable matter yields very little nitric acid by oxidation in the soil, whereas animal matter yields a large amount.

The presence of nitrites in any quantity is generally regarded as strong presumptive evidence of sewage contamination; indeed, some authorities regard their presence in quantities sufficient to be determined as condemning a water. They are practically absent from rain-water, and are so rarely formed under other conditions, except as a stage in the production of nitrates by the oxidation of sewage or organic matter of animal origin, that their presence is to be regarded with suspicion, as indicating that animal matter is undergoing active oxidation, and that the process of nitrification is not yet complete.

It must not be forgotten, however, that nitrites are sometimes formed by the reduction of nitrates (which, as we have seen, are present in rain-water) by inorganic substances, such as metals like iron, zinc, or lead, of which the reservoirs or pipes which come in contact with the water may be composed. Ferruginous sand may also bring about the reduction of nitrates to nitrites; even the brickwork of wells has been found, apparently, to have the same effect. Their presence in deep well or bore water is no evidence of contamination.

It must also be borne in mind that the absence of nitrates and nitrites and free ammonia is not necessarily a proof of the absence of previous sewage contamination. There are organisms present in the soil and in sewage which, in the absence of air, affect the reduction of nitrates and nitrites to ammonia, and finally to nitrogen, thus causing the disappearance of these incriminating substances. It may therefore happen that water, especially well-water, may contain neither nitrates nor nitrites nor free ammonia, although it was originally contaminated by sewage or manure, and, consequently, although free from nitrites and ammonia, may contain pathogenic organisms.

The indications afforded by the presence of chlorine are still less conclusive.

The urine of animals and human beings contains from 500 to 600 parts of chlorine per 100,000, so that when urine or sewage (which contains about 1 per cent. of urine) has had access to the water, the amount of chlorine found over and above the amount of chlorine normally present may often be considerable.

The figures are, however, not always very striking, and it has been calculated that "the whole of the sewage deposited on a square mile of porous gravel would not increase the amount of chlorine in the gravel-water by, on the average, more than 0·5 parts per 100,000."* So that when the chlorine contents are 10 or 12 parts per 100,000, which is quite common, it would be unsafe to condemn a water for such a chlorine content unless other suspicious indications were present or the position of the water with reference to possible contamination were carefully examined.

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* J. C. Thresh, "The Examination of Waters and Water Supplies," page 69.

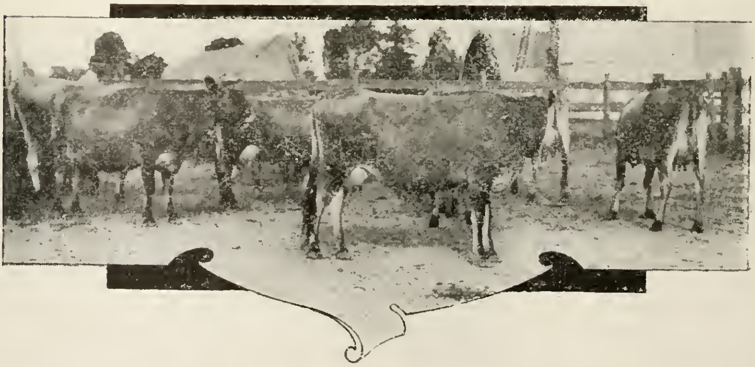
As an example of a typical potable water, the analysis of the Sydney water supply is of interest, and is herewith reproduced. The figures for the substances and determinations with which we have been dealing were kindly supplied by Dr. E. S. Stokes, Medical Officer, Metropolitan Board of Water Supply and Sewerage, and represent the average of over 4,500 samples during the last eight years.

ANALYSIS of Sydney Water.

	Parts per 100,000.
Chlorine	2·75
Free ammonia	0·0002
Albuminoid ammonia	0·0108
Nitrites	Nil
Nitrates	0·0025
Oxygen absorbed (in 4 hours)	0·093

Sydney is particularly fortunate in having available a water supply of such purity that no preliminary treatment is required to ensure its potability, neither softening nor filtration. The latter process is found necessary in nearly all the large water-supplies in Europe and the United States, and the former process in many of them. In our case it is only necessary to keep the catchment area and reservoirs free from contamination. It will be seen from this table that the compounds which we have seen to be indicative of contamination are present in quantities well below those which would justify the suspicion of such possible contamination.

(*To be continued.*)



The Testing of Pure-bred Cows in New South Wales.*

L. T. MacINNES, Acting Dairy Expert.

THIS report has been made to cover the twelve months' period ending 28th February, 1918, and I submit for approval that in future this date shall mark the close of each official testing year. In making this recommendation, it may be pointed out that a rule established for the convenience of breeders makes the annual meeting of the Association fit in with the Royal Agricultural Society's Show fixture, and as the date for holding this varies to correspond with the Easter holidays, it is necessary to close the testing year early enough to enable each year's work (twelve months periods) to be completed without breaking into the month in which, at times, the Show is held. Further, it is thought advisable to bring the records as near as possible up to the date of our annual meeting. Ending the annual period on the 28th February enables both these conditions to be met.

It is proposed to have the records from the inception of the scheme collected and brought into line with this annual period, so that a comparison can be made of each consecutive twelve months' work, which can only be done by having each year's figures ending on the same date. Such comparisons, however, will not show what the average yields of all the herds of the various breeds are, because in proportion to the number of pure-bred stock in the State, the percentage tested is so small. However, it may demonstrate whether those that have been tested are showing improved production—that is, whether breeding for dairy utility purposes is progressing, stationary, or going back. But even here, the varying seasons will militate against comparing one year's work with another, unless all the breeders concerned go in for a comprehensive system of hand-feeding, to supplement or even at times take the place of the natural pastures. This matter of feeding dairy stock is one of the utmost importance. As regards those animals undergoing their tests, it is not fair to expect them to give a good yield unless they receive plenty to eat, and further than that, unless suitable changes of diet are supplied throughout the year. It is satisfactory to note that during the period under review, breeders were alive to this and fed their stock accordingly, even though, on account of the good season, there would have been some excuse for relying solely on natural pastures.

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* Extracted from a report for the year ending 28th February, 1918, submitted to the Council of the United Pure-bred Dairy Cattle Breeders' Association of New South Wales at their Fourth Annual Meeting.

Review of the Year's Work.

The figures for the work of previous years have been taken from the Annual Reports of the Department of Agriculture, which are made up to the 30th June of each year. The following tables for twelve months ended 30th June, 1916 and 1917 respectively, will show how those two periods compare :—

Breed.	No. under Test.		No. completed 273 days.		Average Yields.			
					Butter.		Milk.	
	1916.	1917.	1916.	1917.	1916.	1917.	1916.	1917.
					lb.	lb.	lb.	lb.
Jerseys	27	37	94	28	306	388	5,199	6,320
Milking Shorthorns ...	26	65	11	46	439	410	8,567	8,827
Ayrshires	12	19	20	14	365	382	6,866	8,130
Guernseys	7	15	1	8	261	326	4,516	5,923
Total	72	136	126	96	...	...	...	...
Average	...	...	...	...	327	392	5,720	7,752

It will be seen from the foregoing that increased productiveness was made in all cases, except that of the Milking Shorthorn, which breed showed a very slight decrease. The average increase was 65 lb. butter (20 per cent.) and 2,032 lb. milk (25·5 per cent). While the number of cows undergoing test was greater in 1917 by sixty-four, the number to complete the 273 days period was less by thirty than at the 30th June, 1916.

The following table compares the results of the twelve months ending 28th February, 1918, with those for the year ending 30th June, 1916 (twenty months earlier).

Breed.	No. under Test.		No. completed 273 days.		Average Yields.			
					Butter.		Milk.	
	30th June, 1916.	28th Feb., 1918.	30th June, 1916.	28th Feb., 1918.	30th June, 1916.	28th Feb., 1918.	30th June, 1916.	28th Feb., 1918.
					lb.	lb.	lb.	lb.
Jerseys	27	13	94	19	306	436	5,199	7,041
Milking Shorthorns ...	26	29	11	44	439	3 3	8,567	7,941
Ayrshires	12	15	20	14	365	397	6,866	8,447
Guernseys	7	4	1	7	261	377	4,516	6,463
Illawarras	...	2	...	...	...	...	...	...
Holsteins	...	3	...	...	..	...	...	...
Total	72	66	126	84	...	...	..	..
Average	...	...	...	...	327	402	5,720	7,699

Here again, all breeds with the exception of the Milking Shorthorn show marked increase in productiveness, both for butter and milk. In the case of the Milking Shorthorn breed, a further small decrease is shown.

Taking the average yields of all breeds, we get the following :—

Date.	No. under Test.	Completed 273 days.	Butter.	Percentage Increase.	Milk.	Percentage Increase.
Year ending—			lb.		lb.	
30 June, 1916 ...	72	126	327	.....	5,720	......
30 ,, 1917 ...	136	96	392	19·87	7,752	35·5
28 Feb., 1918 ...	66	84	402	2·55	7,699	(—) 0·68

(—) Decrease.

Each period shows an increase in the butter yields, while the milk yield is considerably greater in the second period, but has slightly decreased at 28th February, 1918, though the net result is over one third greater than at 30th June, 1916.

Again, taking the average yields, we find that during the three periods it took the following lb. milk to make 1 lb. butter :—

Year ending 30th June, 1916—17·5 lb. milk equal to butter-fat test of 4·9 per cent.
,, ,, 1917—19·8 ,, ,, ,, 4·4 ,,
,, 28th Feb., 1918—19·1 ,, ,, ,, 4·5 ,,

This is interesting as showing that while the milk and butter yields have increased, as already shown, during the period covered, the butter-fat content of the milk had decreased by 0·4 per cent., or in other words it took 1·6 lb. more milk to make a lb. of butter during the latest period than it did during the first. This demonstrates that the increased yield is due to the greater volume of milk given per cow, such increased volume being sufficiently large to counterbalance the deterioration in the butter-fat content. Even with this lower test, it can be seen that the legal standard is exceeded by 1·3 per cent. The foregoing comparisons, as far as they go, point to a satisfactory condition, but the record is to an extent counteracted by the continued decrease in the number of cattle tested. Taking the same three periods, it is found that while at 30th June, 1916, 126 cows completed their test, for the year ending 30th June, 1917, this number had decreased by thirty; while for the period just ended, a further decrease of twelve is shown, making a total decrease of forty-two in the number of records for the three periods. This would account for the increased yields to a considerable extent, as it shows that breeders are not entering as many cattle for testing.

The falling-off in the numbers submitted is not limited to any one breed—it affects all, as is shown in the following table :—

NUMBER of Cows completing 273-days periods during the year ended :—

	30 June, 1914	30 June, 1915.	30 June, 1916.	30 June, 1917.	28 Feb., 1918.*
Jerseys	258	199	94	28	19
Milking Shorthorns	68	22	11	46	44
Ayrshires	.....	.. ..	20	14	14
Guernseys	10	18	1	8	7
	336	239	126	96	84

* Portion of this year is included in or overlaps the preceding column for 30th June, 1917.

It will be seen by the foregoing that the Jerseys show by far the greatest falling-off. This coincides with the fact, as shown in a previous table, that this breed shows the greatest increase in butter and milk yields. The decreases in the numbers testing 273 days between the first period and the last, given above, are as follows:—

	No. of Cows	Decrease.
		per cent.
Jerseys	239	92 6
Milking Shorthorns	24	35·3
Ayrshires	6	30 0
Guernseys	3	30·0

Taking the last three breeds together, we have a total of ninety-eight tested for their respective first periods, and a decrease of thirty-three between then and the last testing period, a falling-off of 33·6 per cent., as against a similar falling-off of 92·6 per cent. in the case of the Jerseys. This falling-off in the number of privately-owned stock coming forward for testing is a matter that urgently requires attention.

Urgent Need for Testing.

The importance of testing pure-bred stock and its bearing on the future of the dairy industry cannot be too much stressed. In view of the crisis we are now going through, and the strenuous competition we all expect after the war, I take this opportunity of bringing the matter once more under the notice of all concerned. Between prospective lower values likely to be realised for our dairy produce and a possibility of further increases in the cost of production, it seems that the salvation of the dairying industry lies in increasing the average yield per cow as quickly as possible. The crux of the whole position lies in the cash value of the return per cow for the year. If the average productiveness in milk and butter of our cows could be doubled, it would enable higher expenses to be met, and at the same time allow our produce to be sold at a lower price.

There are two ways of doing this, and both depend on testing for rapidity of result:—

1. By culling out the unproductive animal—this refers not only to the female but also to the bull.
2. To breed up on production records in addition to striving for constitution and type.

To achieve the full benefits of the testing movement, it is, in my opinion, necessary to test all stock, not only pure-breds but grades; and not only test the cows, but ensure that only the stud bulls able to reproduce high yields in milk and butter fat be used on our dairy farms. The pure-bred, the animal with a long line of ancestry, is more likely to do this, but it does not follow that *all* pure-bred sires can do so; therefore it is necessary to discriminate amongst the pure-breds. I would urge then, not only on the members of the Association, but on all owners of pure-bred stock, the necessity for having them put under test. It is vital that the yields of our average dairy cows be greatly increased in the immediate future. It is further urged on the dairy farmer with the average grade herd to breed up his stock by using only a pure-bred sire from one of those strains that can show the necessary production records. We now live in times where speed in achieving effective results is of the greatest importance. The Department of Agriculture recognises the urgency and importance of this matter, and will continue to aid in every way possible the furthering of the testing movement and the objects for which this Association was founded.

Through no fault of the Dairy Branch, it has within the last few months been found impossible to test the cows submitted by one breeder from Inverell, but it is hoped that sufficient staff will shortly be available to test any herd that may be submitted. In the Richmond-Tweed River districts there promises to be several more herds coming under test, and arrangements are being made to send an additional tester there. As the number of herds coming under test warrants it, the Department will put on additional staff to cope with the work.

Cows Testing beyond the 273-days Period.

Besides completing the required 273-days test, sixteen cows show a record for a longer period. The most prominent of these were :—

JERSEYS.

Name of Cow and Owner.	Age.	Butter.	Milk.	Period.
		lb.	lb.	Days.
Brown May (imp.)—Mr. S. Hordern	5 years ...	574·4	9,411	273
		610·7	10,011	303
Brighton Vanilla II—Mr. C. R. G Macdonald.	5 ,, ...	808·8	14,867	273
		1,011·92	18,197	365
Brighton Coomassie II—Mr. C.R.G. Macdonald.	1 yr. 10 mths.	429·5	6,754	273
		571 5	8,655	365

As far as can be judged from available records of other countries, it would appear that the milk production of Brighton Vanilla II for 365 days is well to the front, being only beaten by two or three American cows as follows :—Passport, 19,744 lb., Eminents Beos, 18,783 lb. The milk yield of Jacoba Irena, who gave 954 lb. butter-fat, is not available. Our representative, with 18,197 lb. milk, thus seems to compare more than favourably with the leading world record breakers of her breed, which should be a matter of gratification to her owner and to the Association.

AYRSHIRES.

Name of Cow and Owner.	Age.	Butter.	Milk.	Period.
		lb.	lb.	Days.
Jean of Kabibinokka—Mr. Jas. Pritchard.	2 yrs. 9 mths.	409·2	7,842	273
		530·8	9,723	365

MILKING SHORTHORNS.

Name of Cow and Owner.	Age.	Butter.	Milk.	Period.
		lb.	lb.	Days.
Melba VII—Scottish Australian Investment Co.	6 years ...	836·3	14,371	273
		1,021·59	17,364	365
Empress of Burradale—Mr. J. T. Young.	9 ,, ...	736·16	15,073	273
		894·58	17,923	365

I cannot come across any records obtained in other countries of this breed for comparison with the foregoing, but there can be few which have passed the milk and butter yields of Melba VII and Empress.

GUERNSEYS.

Name of Cow and Owner.	Age.	Butter.	Milk.	Period.
		lb.	lb.	Days.
Tulip de Pres (imp.)—Mr. E. P. Perry.	4 years ...	582	9,750	273
		689·93	11,451	365

It is interesting to compare the record of Tulip de Pres with that of Dr. Kinross' Merton Margaret II (imp.), which in the testing year of 1913–14 put up—

569 lb. butter, 8,626·75 lb. milk, in 273 days.
694 ,, ,, 10,399·75 ,, ,, 365 ,,

These two cows hold the Australian records for production over both 273 and 365 days periods. It will be seen that Tulip de Pres leads in butter for 273 days (the official period) as well as in milk production over both periods, while Merton Margaret II leads in butter yield for 365 days.

It is a matter for congratulation that this Association now holds the production records in Australia for the Jersey, Milking Shorthorn, and Guernsey breeds (cows), while I think it will be hard to beat in Australia the records in their class put up by the Ayrshire heifer (under 3) Jean of Kabibinokka, and the Jersey heifer (under 2) Brighton Coomassie II.

Records of cows have, as they completed their periods, been published regularly in the *Agricultural Gazette*, and in addition, particulars of feeding were published. The amount of butter-fat is now shown in addition to the amount of commercial butter.

1,000 lb. Butter Cows.

During the past year two cows testing under the Association's rules exceeded the 1,000 lb. butter standard. When the Department of Agriculture some years ago offered a prize of £100 for the first cow to put up this record in 365 days under certain specified conditions and testing under the rules of this Association, it was thought that many years would elapse before the prize would be claimed. It is, indeed, a noteworthy fact that within such a short time, not one, but two cows have put up the required quantity of butter—though there is still a doubt as to whether the prize will be claimed, as it remains to be seen whether one of the conditions, viz., giving birth to a calf within eighteen months after the commencement of the test, is complied with. But whether this is done or not, the breeders of both cows are deserving of great praise for their enterprise and ability. They are achievements to be proud of.*

Suggestions for Improving the Scheme.

With a view to widening and improving this testing scheme, the following suggestions are submitted for consideration :—

1. That samples of the different fodders fed to cows be forwarded to the Chemist of the Department of Agriculture for analysis, in order that a better idea may be arrived at as to the nutritive value of each ration.
2. Rule 13 might be made more explicit in regard to supplying particulars of foods used.
3. Rule 6 be amended, or an additional rule added, to provide for some system in calculating the test which will equalise the advantages and disadvantages under which a cow is tested according to the time the first test is taken after the date of calving.
4. The judging of pure-bred stock in the show ring by taking production records into consideration along with appearance, type, constitution.
5. That the annual Easter gathering of breeders, buyers, and others interested in building up our dairy herds be availed of for propaganda and educational work in connection with forwarding the objects for which this Association was founded. I would suggest, as one means of doing this, that, during next Easter week, time be set apart for the delivering of a lecture on the herd-testing movement and its relation to the advancement of dairying. Such a lecture could be made more interesting by the display of a series of lantern slides showing representatives of the various breeds, their own records and those of ancestors and descendants where available—thus impressing on the audience the meaning and value of heredity in relation to production and the other attributes, such as type and constitution, that go to make up high-class pure-bred dairy stock. I think it could be arranged with the Department of Agriculture to prepare such lantern slides, and the Department would also be willing to assist in any other way.

Just before the close of the period under review, two breeders of Illawarra cattle and one of Holsteins entered their cows, so that representatives of all the principal dairy breeds are now being tested under the rules of the Association. This will make the records to be compiled for the coming year more interesting than ever. Great interest is being manifested in the testing of pure-bred cows on the Northern Rivers, where, through the Herd-testing Associations, the benefits of testing have become known. It is hoped that more of the herds from the Tweed–Richmond district will be submitted during the year.

The yields of the tested cows have been averaged under the different specified ages and standards set out in Rule 13A, viz. :—

2 years at commencement of test	200 lb. butter.
3 ,, ,, ,, ...	300 ,,
4 years and over at commencement of test ...	350 ,,

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* Full particulars of this competition have already been published in the *Agricultural Gazette*, December, 1917, and January, 1918, issues.

TABLE of Average Yields of Stock, for Year ended 28th February, 1918:—

Breed.	Age.	No. Tested.	Average Yield.	
			Butter.	Milk.
			lb.	lb.
Jerseys	2	3	381·2	6,251·3
,, ...	3	2	437·6	6,785·0
,, ...	4 and over ...	14	447·2	7,247·3
Milking Shorthorns ...	2	9	332·0	6,813·4
,, ,, ...	3	12	347·4	7,191·4
,, ,, ...	4 and over ...	23	440·0	8,773·7
Ayrshires	2	......	.. ...	......
,, ...	3	2	346·8	7,598
,, ...	4 and over ...	12	404·8	8,589
Guernseys	2	1	253	3,994
,, ...	3	2	321	5,736·5
,, ...	4 and over :	4	435·7	7,443·5
All Breeds	2	13	337·3	6,466·8
,, ...	3	18	354·4	7,029·8
,, ...	4 and over ...	53	433·6	8,228·3

SUMMARY of all Cattle Tested, 1st March, 1917, to 28th February, 1918.

	Test completed.	On Test.	Submitted, but not yet tested.	Submitted and tested, but test abandoned before completion of period.	Total.
Ayrshires, privately owned	14	15	.. ..	......	29
,, Government owned	3	47	......	9	59
Jerseys, privately owned	19	13	14	11	57
,, Government owned	42	46	19	......	107
Milking Shorthorns, privately owned ...	44	29	......	5	78
,, ,, Government owned	32	32	41	......	105
Guernseys, privately owned	7	4*	......	4	15
,, Government owned... ...	41	14	7	......	62
Illawarra Shorthorns, privately owned...	......	2	......	. ...	2
,, ,, Government owned	......	......	......	......	...
Holsteins, privately owned	......	3	......	......	3
,, Government owned	8	10	26	......	44
Red Polls ,, ,, ...	8	8	5	......	21
Kerrys, ,, ,, ...	14	6	1	......	21
	232	229	113	29	603

* Including two grade cows.

ELEPHANT GRASS ON THE NORTH COAST.

MR. P. SPINAGE, of Swan Bay, in the Coraki district, writing to the Manager of the Wollongbar Experiment Farm with regard to this grass, stated that the roots grew wonderfully. There were sixty stalks to one stool, and these were 16 feet high. He fed some of it to his saddle horse, which prefers it to any other fodder and eats up every bit of it. So far, it beats anything he ever grew at Swan Bay.

Tick-resistance of Cattle.

Dr. T. HARVEY JOHNSTON and Miss M. J. BANCROFT, B.Sc., Biology Department, University, Brisbane.

Owing to the presence of cattle ticks (*Boophilus australis* Fuller) in the Northern Rivers Districts of New South Wales, the following notes and requests may be of some interest to the dairy-farmers of the Tweed and Richmond Rivers.

The subject of tick-resistance of cattle has in Queensland during the past few years been associated with the name of Mr. Munro Hull, of Eumundi, on the North Coast Railway line, in that State, and is at present being investigated by us.

The vital importance of the tick problem (as distinct from the subject of *tick fever* or *Redwater*) is brought home to every cattle man by the depreciation in value of an animal caused by *tick worry* and the trouble and expense incurred in erection and maintenance of dips. The established fact that Mr. Munro Hull has had now for several years a large number of animals, which have become tick-resistant, and have remained practically free from ticks, though running in ticky paddocks, where control animals become heavily infested, and that these resistant cattle are never dipped or sprayed or treated in any way for ticks, alone warrants some attention being paid to the subject and to the possibilities of spreading the peculiarity.

In view of the fact that one or more tick-resistant animals occur in very many herds and the utter impossibility of examining more than a small fraction of the total number, all who are interested in the subject are invited to send to either of the above-named any observations they have made, or may make, which may help in the solution of the problem. It is felt that the experience and opinions of observant dairy-farmers and cattle raisers would be extremely valuable.

Correspondents are particularly asked to note that the investigators are *not* at present concerned with the subject of *cattle tick fever*. It is hardly necessary to state that only *facts* are desired, uncertain statements being devoid of scientific value.

Authentic observations under the following headings as regards tick-resistant animals would be useful :—

1. Are these animals more usually of any particular breed ?
2. The length and texture of the hair.
3. The colour, texture and oiliness of the skin.
4. The general condition and stamina of the beasts.
5. The length of time the animals have been resistant. Have they possessed the resistance from birth, or have they acquired the peculiarity later in life ?

6. The transmission of this resistance to progeny.
7. The nature of the country on which the animals are running.
8. Influence (if any) of food.
9. The effect (if any) of dipping upon such resistant animals.
10. Whether the exudate described below has ever been noticed on these cattle.

Exudate found on certain Tick-resistant Cows.

This exudate or so-called serum has on many occasions been referred to by Mr. Munro Hull who was, as far as we know, the first to bring it under public notice in Australia.

It consists of drops of a clear yellow fluid, which appear on the skin on various parts of the body, notably on the escutcheon, where it is more evident owing to the shortness of the hair. These drops become thick and sticky, ultimately forming little granular masses or thin flat, yellow scabs according to the size of the original drop. These are readily flaked off, leaving a patch of clean smooth skin below. Blood is sometimes present, in which case the resultant scab is discoloured. There is no evidence that each patch of exudate is caused by the bite of the tick. Very occasionally larval ticks have been found attached to a dry scab owing, no doubt, to their having become entangled in the sticky fluid. The affected area is irritable, the cows showing a great desire to lick or rub the part. The condition is apparently more or less dependent on the weather, being more usually seen on a hot muggy day.

There are certain conditions which may be confused with this exudation, *e.g.*, *tick sores.* The only kind of tick sore which is likely to be mistaken for it is that in which the scab appears as a dark blood-stained centre, to which a tick is often seen attached, surrounded by a ring of clear yellow material. Beneath the discoloured centre is a little plug of blood and pus, while, when the scab is removed, a corresponding pit is seen in the skin.

The presence of a depression, often pus-filled, beneath the scab distinguishes a tick sore from the scab formed from the "serous" exudate. The presence of a tick or a depression where the mouth parts of a tick have been inserted is also a marked difference.

Thick whitish scurfy scabs occur especially at the butt of the tail and in the ears of some animals, but no cattle owner is likely to confuse these with any of the conditions above mentioned.

Importations of Stock into N.S.W.*

THE QUARANTINE LAWS AND REGULATIONS.

S. T. D. SYMONS, M.R.C.V.S.,
Chief Inspector of Stock, and Chief Quarantine Officer (Animals).

APPARENTLY the first yearly report presented to Parliament by the Chief Inspector of Stock, New South Wales, was for the year 1869, and was addressed to the Minister for Lands. It was confined to reporting on "Sheep and Cattle;" in the next year a report was furnished on "Live Stock," and this has since been continued annually. In the report first mentioned, reference was made to the quarantining of sheep, a practice which had apparently been in existence for some time, and applied not only to sheep imported from outside Australia, but to those introduced into New South Wales from Victoria, Tasmania, Queensland, and South Australia.

In the report for 1870 there is a very important reference to the matter of the quarantine of imported stock, which reads as follows:—

> I would also again urge the necessity for imported horses and cattle passing an examination and quarantine for 14 days at least, near the port of debarkation, previous to their being allowed to mix with, or come in contact with, those belonging to this Colony, and for preventing the landing of any forage brought out with imported stock. Had such a law as this been in force in this and adjoining Colonies, it is reasonable to suppose that Pleuro-pneumonia would never have got a footing in Australia; and there are many other diseases prevalent amongst stock in Europe which are not known in Australia, and which might be excluded by such enactments as these.
>
> For instance, Foot and Mouth Disease (*Vesicular Aphthæ*), one of the most infectious diseases in stock, is now prevalent in almost every part of England, and although the chances are against its introduction here, it is not impossible for it to be brought out, if not by the stock, by the fodder.
>
> If it were decided that all imported stock should pass such a probation as here suggested, accommodation might be obtained for them on the Sheep Quarantine-ground; and the charges should be fixed at such a rate as would just cover the expense of forage and attendance, in order that the expenses of the quarantine might fall as lightly as possible on the importers of these valuable animals. In case these suggestions are acted upon, I would further recommend that the attention of the Government of the adjoining Colonies should be directed to the subject, because precautions, to be effectual, should be taken by all the Colonies.

It will be agreed that this was a very valuable recommendation. It was made by the late Alex. Bruce, who was then Chief Inspector of Stock. There are several important facts disclosed in the remarks as quoted, viz., that at the time of writing contagious pleuro-pneumonia and foot-and-mouth disease were respectively prevalent in Australia and the United Kingdom; that a quarantine ground in New South Wales was already provided for sheep; and that the quarantining of foreign stock was not as yet practised in the other Colonies.

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* A paper read at the first Convention of Pastures Protection Boards' Officials, Sydney, March, 1918.

Early Legislation.

Apparently the first legislation dealing with stock diseases in New South Wales was the "Scab and Catarrh in Sheep Act," dated 24th October, 1853, followed by the "Diseases in Sheep Act of 1866," which was afterwards consolidated with the "Stock Act of 1901." The first gazetted quarantine area, as the result of the Scab Act referred to, was some land in Surry Hills, situated at the corner of Fitzroy and Dowling Streets; and long after scab was exterminated from this Colony, it was still used for the purpose of quarantining coastal sheep that were proposed to be removed to holdings west of the Dividing Range. In the course of time this sheep quarantine was moved to Randwick, and it is interesting to note that it was closed for a considerable period, and a depôt for sheep established at Summer Hill, on account of the apprehended danger of pollution from the Randwick site of the Centennial Park swamps, which were then largely drawn upon for the Sydney water supply. Later on, when the Prospect water supply was available, the Randwick quarantine was again used.

Incidentally, it might here be mentioned that to deal with imported Victorian sheep and Tasmanian sheep coming through Victoria, there were for many years quarantine depôts at Albury and Moama.

Legislation in regard to imported stock was originally under the administration of the Minister for Lands; later on it was transferred to the Minister for Mines, following that to Mines and Agriculture, succeeded by Lands and Agriculture, and, finally, whilst under State control, by the Department of Agriculture.

Following representations made as to the necessity of providing a quarantine for imported cattle, the "Imported Stock Act of 1871" came into existence, and the first record of any cattle being quarantined was at Garden Island As these animals were supposed to have recovered from an attack of foot-and-mouth disease on board ship, the island was not further used, and for awhile, stock were quarantined at Dawes' Point, but later on a quarantine of a more permanent nature was located at Shark Island.

All classes of stock were quarantined at Shark Island, and a notable detention in the matter of horses was that of Sell's Circus, an American exhibition, the horses being removed there from the circus ground at Moore Park on account of an outbreak of glanders.

Later on an area at Bradley's Head was utilised as an animal quarantine, being brought into existence, I understand, on account of Shark Island being congested at times, and with the object of less close association of newly-imported animals with those whose period of detention had almost expired.

An animal quarantine station was also established at Newcastle, but this was used for little else than the quarantine of dogs whilst ships were in port, a very considerable number of which were carried, especially in the old days of sailing ships, and thus had to be provided for.

After the restrictions on the movement of coastal sheep were suspended, Randwick was utilised for a considerable period for the purpose o quarantining horses. When Shark Island was abandoned, it having been given over to recreation purposes, another animal quarantine was established at Athol, in what was then portion of the Military Reserve, which also embraced Bradley's Head. When no longer required as a military reserve, the whole of this area was subsequently re-dedicated as Ashton Park.

Commonwealth Control.

By the Quarantine Act of 1908, the importation of stock from overseas into the Commonwealth passed from the administration of the States to the Federal Government, and eventually Randwick and Bradley's Head were closed down, as well as Newcastle, the last-named place consequent upon ships' dogs and other animals being held on board during the period the vessels were in port under a shipmaster's bond. The land at Athol was later on embraced in an area dedicated for the purposes of a Zoological Garden, known as Taronga Park, and as a result other provision had to be sought. For over two years endeavour was made to obtain a suitable site either on the harbour foreshores or Parramatta River, without avail. Although one or two likely sites were selected, nothing was brought to completion on account of the many objections of the residents in the various localities. It is, perhaps, unnecessary to state that the majority of these objections were of an absurd nature, but at any rate the combined political and parochial effort was sufficient to defeat the object in view, the term "quarantine" arousing far-reaching opposition.

Athol being no longer tenable, in December, 1916, the old Zoological Gardens at Moore Park were utilised, and although horses have had to undergo quarantine at private stables, comfortable quarters were provided there for cattle, sheep, pigs and dogs, and we are still in occupation. Meanwhile, the Federal Government acquired by purchase a satisfactory block of land at Abbotsford, on Hen and Chickens Bay, Parramatta River, the buildings on which are well towards completion, and we hope to be able to enter into occupation probably in April of this year. This location provides for an essential requirement as to effective quarantine for animals, viz., the tranference by water from the ships to the isolation depôt; and as the vendor of the property, a well-known City commercial man, raised no objection to this establishment adjoining his residence, the efforts of the local "pump" brigade—which at one time had to be reckoned with—soon subsided. At this stage it may be opportune to mention that for many years a quarantine tender, a small steamer specially built for the purpose of carrying stock, and named the "Golden Fleece," was in commission. In recent times, however, animals have been carried on a stock punt, which has been found particularly convenient for the purpose, and which is not such an extravagant proposition as the "Golden Fleece," as when not in actual use, it can be laid up, and consequently maintenance has been found to be much more economical.

The quarters at Abbotsford, both for stock, permanent and temporary attendants, &c., are an improvement on and of a more substantial nature than those which existed hitherto; and on account of the opening of the Panama Canal, whereby it is expected that in the future Sydney will largely be the first port of call for ships arriving in the Commonwealth, it is thought that numbers of stock intended for other States may undergo quarantine here, and, fortunately, the area permits of the buildings being suitably extended if found to be necessary.

Quarantine Regulations.

Referring again to the Imported Stock Act of 1871, its first provisions in regard to quarantine applied to cattle and sheep only, and it was not until the Imported Stock Amendment Act of 29th August, 1884, that the definition of "Stock" was altered to include goats, swine, dogs, and such other animals as may be proclaimed from time to time in the *Government Gazette*, and a proclamation in regard to these animals appeared in the *Government Gazette* of the 8th January, 1885. As to when horses first underwent detention in quarantine the evidence is not very clear, and although it is believed the regulations applied to them some time beforehand, the proclamation including horses did not appear until the 10th January, 1893. My own opinion is that any previous action was taken under the assumption that they might be included under the definition of "cattle"; but as a result of Sells Bros. applying for an injunction in regard to the detention of their circus horses, the proclamation before referred to was thought to be necessary, it being decided by the Full Court that horses were not cattle.

The periods of detention of stock in quarantine, as may be imagined, have considerably altered from time to time, on account of the prevalence, or otherwise, of disease in the country from which the animals have been imported. Thus, at one time dogs were subjected to six months' quarantine; now they have only to undergo sixty days, and, in the case of sheep, the period has been reduced by one-half, viz., from sixty days to thirty days. Also, a very considerable alteration has taken place in regard to the countries from which stock are admissible. At first, horses and dogs were admitted from any country; but now the importation of the former is restricted to the United Kingdom, Canada, and the United States of America, and, in the case of the latter, from the United Kingdom and New Zealand only, except in the case of *bona fide* performing animals, which are held in perpetual quarantine until leaving the country. In addition to those animals just mentioned, provision is made for the introduction of asses and mules from the United Kingdom, Canada, and the United States of America, and asses from France, Spain, and Portugal; but why mules are not admissible from these last three countries I am not in a position to explain. Cattle can be introduced from the United Kingdom, Canada, or the United States of America; sheep and goats from the United Kingdom and Canada; and swine from the United Kingdom, Canada, and New Zealand. Of course, all these animals just mentioned are only admissible when they are accompanied by such certificates as are required from the country of origin, undergo the usual detention in quarantine, are subjected to such treatment as may be prescribed, and are duly certified as being in a satisfactory state of health at the termination of their respective periods of detention. All stock coming from New Zealand are admissible if duly certificated from there, on inspection only, excepting swine, which are subjected to a detention of twenty-eight days.

Importation of Stock for Slaughter.

Apart from the introduction of foreign stock for stud purposes, our quarantine laws also admit of the introduction, by special permission, of animals for early slaughter. These conditions are only availed of in times of drought, and ordinarily were limited to the introduction of cattle and sheep from New Zealand. However, on account of drought, and also the high prices then ruling, about three years ago several shipments were brought from other sources. Particulars of these, which are certainly of considerable interest, are as follows:—

New Caledonia.

*In December, 1915, six head of fat cattle arrived from Noumea. Inspection on arrival revealed that they were badly infested with a fly named *Hippobosca equi*. As they were carried separately in narrow boxes, and being rather wild, they were considerably knocked about, one being dead. They were heavily sprayed on board ship with a mixture of oil and oil of tar, and removed in the boxes to the Glebe Island abattoirs. On *post mortem* examination two were found with lesions of recovered pleuro-pneumonia, the other three being sound. An examination of the carcase of the animal that died showed no disease. Blood smears were also taken and examined, with negative results. Great care was exercised in the spraying of these animals, and the destruction of the fly, as, if introduced into Australia, it might prove a very undesirable pest amongst stock. It was also decided for this reason to place an embargo on any further shipments.

Fiji.

Two shipments of fat cattle, totalling eighty-six head, arrived from Fiji during the latter part of the year 1915, and after the usual veterinary examination prior to landing, were slaughtered at the Glebe Island abattoirs. *Ecto* parasites were absent, and blood smears taken from each animal on slaughter were examined, with negative results. A rather large percentage of the animals showed slight lesions of tuberculosis, but, apart from this, they were absolutely sound. The conditions as revealed on slaughter fully verified reports previously received by the Department from Fiji as to the health of cattle in that country.

Solomon Islands.

During the early part of the year 1916 three shipments arrived from the Solomon Islands, totalling sixty-five head. They were all from the estates of Lever Bros. Plantations, Limited, were in excellent condition, and showed traces of good breeding, they being the result of the crossing of Red Polled Angus bulls with ordinary cows of mixed breeds, taken to the islands either from Queensland or this State. No *Ecto* parasites were found, and blood smears showed negative results. A small percentage of these animals were affected with lessons of tuberculosis, and a few with *Œsophagostomum columbianum*, being the parasitic nodular affection of the small intestines commonly known as "pimply gut." Apart from this they were quite sound. These shipments were looked upon favourably by the trade, and further arrivals may be expected when the steamer service becomes more regular.

Norfolk Island.

During the period, 1915, to May, 1916, five shipments of cattle arrived from Norfolk Island, totalling seventy-one head. The animals arrived in good order generally, and on examination at slaughter were found to be entirely free from disease, except one or two bullocks which were affected with the nodular condition of the intestines previously referred to.

In addition to the matter of dealing with the introduction of live stock, the regulations under the Quarantine Act also treat with the importation of fodder (hay and chaff) subject to Ministerial permission, hides, skins, wool and hair, bones and animal manures; so it will be readily understood that the duties under this Act are of a very varied and extensive nature.

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*Annual Report of Stock Branch, Department of Agriculture, N.S.W., 1916.

The importations of fodder are not very frequent, and have served a good purpose in time of drought. At the same time, there is no doubt that a lot of undesirable weeds have been thus introduced.

Apart from the attendant resident at the station, who is in the Federal service, the administrative duties under the Act are performed by myself as Chief Quarantine Officer (animals), and members of my staff, who are also authorised as Federal quarantine officers for such purpose. By an arrangement arrived at between the State and the Commonwealth, a moiety of some of the salaries is paid, and there are also allowances for clerical assistance, &c. The duties are carried out very smoothly, and, it may be recorded, virtually without any political interference.

The Introduction of Stock Diseases Prevented.

The quarantine laws aim at the prevention of the introduction of stock diseases non-existent in Australia, some of which are confined to various species of animals, but others are also capable of transmission to human beings. In this connection might be mentioned, in relation to horses, asses, &c., the virulent contagious disease known as glanders, a disease due to a specific micro-organism (*Bacillus mallei*), a loathsome affection, which can be passed on with fatal results to the attendant, or any person exposed to infection. Then, again, there are the serious diseases known as surra, dourine, nagana, and mal de caderas, which are all forms of Trypanosomiasis, due to various micro-organisms of a flagellate nature that are found in the blood stream of the animal affected ; also, amongst equines, another serious affection, Epizootic Lymphangitis, is rampant in some countries.

Glanders was introduced into New South Wales in 1891, being found amongst forty-three horses from America in Sell's Circus, which was located at Moore Park. On discovery, strict quarantine was imposed ; any animals showing the disease were destroyed. The balance were sent to Shark Island, where four more were subsequently found affected and destroyed, the remainder being reshipped back to San Francisco. In more recent years, prior to prohibition being exercised against Asiatic countries, two ponies which were introduced from Java reacted to the Mallein test, and were destroyed. By these prompt measures glanders was prevented from obtaining a footing in this country.

In 1912 a memorable shipment of horses came from America, consisting of 147 thoroughbreds, brought to this State by Mr. Wheatcroft, allegedly on account of legislation in that country having much restricted racing operations. This importation being far in excess of what our usual accommodation provided for, a property was leased at Leppington, near Ingleburn, the horses being carried direct from the Pyrmont Wharf by special train. The trucks were afterwards thoroughly disinfected, and as these horses had done a deal of moving about in America, racing, &c., and owing to our previous experience with Sell's Circus, an anxious time was spent until these animals had successfully completed their quarantine period.

It is recorded that surra was introduced into Western Australia in 1898 through an importation of camels from India, and this outbreak was also successfully stamped out.

In connection with cattle and other ruminants, the quarantine laws are aimed against the introduction of the serious disease rinderpest, known also as "cattle plague," which has at times decimated the herds of various countries—notably, South Africa a few years since.

Aphthæ Epizootica, or foot and-mouth disease (also communicable to man, although not as serious as glanders), of which there have been outbreaks within recent years in Great Britain and America, has involved heavy expenditure in eradication in those countries. In 1885, and the two following years, the importation of cattle was prohibited on account of this disease being prevalent in the United Kingdom; and, in quite recent years, other short periods of prohibitions on importations have occurred, due to outbreaks in the United Kingdom and America.

Johne's disease is a wasting and fatal disease of cattle; and there is also the condition known as warbles, due to the infestation of the animal by the bot (larva) of the Warble Fly (*Hypoderma bovis*), which has caused great losses in some countries on account of the depreciated value of the leather prepared from the damaged hides. Relative to this matter, I might state the regulations provide that cattle shall not be shipped from any country from which they can be introduced into the Commonwealth during the months of June, July, August and September; but I entirely disagree with this regulation.

Regarding most of these dangerous diseases, as mentioned, they are more or less rife in South Africa, India, China, Japan, Philippine Islands, the Malay Archipelago, &c.; therefore it is a wise precaution to limit the importation of animals from countries of which we have more complete records, and where disease is less prominent.

In sheep, also, we have to guard against the introduction of scab and sheep pox. Scab is due to a skin parasite, which causes extreme irritation to the skin, with consequent very serious effect on the health of the animal, resulting in ragged and torn fleeces, and inferior quality of the wool. Scab was present amongst our flocks for many years, but the Colony was declared free from this affection in the year 1869. A later outbreak occurred here in 1884, being found on a station at Carcoar, amongst some sheep that were imported from America a short time before. This outbreak was successfully combated by strict quarantine, effective periodical mustering, regular dipping, &c. New Zealand was declared officially free from scab in 1892, and Western Australia in 1897. In this connection it might be interesting to note that at one time it was the regular practice at the annual sheep sales, in Sydney, to dip the sheep brought from other States and New Zealand on the premises of Goldsbrough, Mort & Co., at Circular Quay.

Pigs may also introduce the disease known as trichinosis, due to a small worm found in the muscular tissue and other parts of the affected animal, and which can also be transmitted to man. Unfortunately, swine fever has gained a slight foothold in the country; and as long ago as 1885 our records mention that a disease, resembling swine fever, was found amongst the pigs on the ship "Parthian," when all the animals were destroyed.

The lengthy quarantine imposed on dogs in the old times was due to the affection rabies, also known as hydrophobia or "canine madness," and on account of the incubative period of the disease being so indefinite. A very considerable reduction in the period of detention mentioned early in this paper was affected on account of the eradication of this disease in the United Kingdom, as the result of a strict muzzling order, which was carried out for some years, and from the disease never having been existent in New Zealand.

It is not known that this disease was ever introduced into New South Wales, but suspicious animals have in the past been destroyed, both on board ship and in quarantine.

Animals whilst detained in quarantine are subjected to various diagnostic tests, including, in the case of horses, the testing with mallein, and, in the case of cattle, with tuberculin; also, if necessary, blood smear examinations are carried out, and other biological tests. Gear of all sorts accompanying animals is subject to thorough disinfection, and no litter is allowed to be removed from the premises, being destroyed by fire.

Value and Extent of Stock Importations.

It is not proposed to specially mention the various importers, as the list is altogether too formidable. I might say, however, that apart from the importations of stock by institutions and persons directly connected with the pastoral industry, this State, at any rate, is greatly indebted to many of our prominent commercial men for the introduction of high-class animals of all kinds.

In relation to stock, the records indicate that amongst the cattle the importations numerically show that Shorthorns and Herefords are much in excess of any other breeds, although a fair number of Devons have been introduced from time to time. As to sheep, coming not only from the United Kingdom, but from America, France, Spain, and Germany, the Merinos far outnumber the other breeds; and in regard to horses, thoroughbreds head the list.

While it is not directly associated with the main subject of this paper, brief reference may be made to the development of the sheep industry in this State from its earliest history, and in this connection the evidence given by Captain Macarthur, of Camden Park, before a Commission held in Sydney in 1820, may be quoted.

He stated that he purchased, in 1794, sixty Bengal ewes and lambs, which had been imported from Calcutta, and very soon after he procured (from the captain of a transport from Ireland) two Irish ewes and one young ram. By crossing these two breeds they produced a mingled fleece of hair and wool. This circumstance originated the idea of producing fine wool in New South Wales.

In 1797 he secured four Merino ewes and two rams, being a portion of twenty Merinos imported from the Cape of Good Hope, the balance being distributed amongst different individuals, who did not take any precautions to preserve the breed, and they soon disappeared. Macarthur's flock, however, was guarded against an impure mixture, and increased in number and improved in quality of wool.

In a year or two he purchased 1,200 sheep of the common Cape breed; and in 1801 he took to England specimens of his pure Merino wool, which was reported on as equal to any Spanish wool, and the crossbred as of considerable value. Being thus encouraged, he purchased nine rams and one ewe from a Royal flock, but only landed five rams and one ewe. These were some of the progeny of Spanish Merino sheep (Negrette) presented to King George III by the Marchioness del Campo di Alange. It was, therefore, from the above sources that the foundation was laid for our Australian Merino.

Apart from Captain Macarthur's experience as quoted, records show that in these early days there were also imported by other settlers small numbers of Southdown and Leicester sheep, and by crossing with the common sheep already here, a great improvement took place both in the fleece and carcase. Others followed Macarthur's example, and imported Merinos also.

In the year 1800, twelve years after the arrival of the first ship, there were only 6,124 sheep in the whole settlement. Three years later the number of sheep had increased to 10,157; and in the year 1828 they amounted to 536,391.

The first exportation of wool took place in 1810, and was only 167 lb., but the production increased rapidly, and in 1831 the export was 1,134, 134 lb.; while twelve months later, viz., 1832, the export was 2,377,057 lb., and in 1833 it was 3,516,869 lb., and realised up to 4s. 6d. per lb.

The appraisements for the year 1917 show approximately 800,000 bales, of an average each of 360 lb., surely a noteworthy advance!

RAIN-WATER FOR BOILERS.

A correspondent who was interested in Mr. Guthrie's articles on "Water on the Farm," asked whether rain-water caught and held in galvanized iron tanks was suitable for steam boilers.

In reply, Mr. Guthrie stated that rain-water was eminently suitable for use in boilers, as it was a soft water, and contained no scale-forming ingredients. The only possible risk was that the dissolved carbonic acid might cause corrosion in the outlet pipes, but this was not likely to occur.

At the head of all sciences and arts, at the head of all civilisation and progress stands not militarism, the science that kills, nor commerce, the science that accumulates wealth, but agriculture, the mother of all industry, and the maintainer of human life.—James A. Garfield.

A WEED NEW TO AUSTRALIA (*Chondrilla juncea* L.).

MR. E. FIELD, of Marrar, Western New South Wales, in sending this plant, said :—

> It is going to be a very bad pest, and almost stops the harvesters and blocks up the riddles when stripping, and generally is of a spreading, interwoven habit. It grows from the roots, remaining in the ground from year to year, and keeps on spreading. Stock will not touch it. It came up from the parent root in a 60-acre fallow paddock this spring, and though there were 200 sheep and 20 horses running on it, they never even touched it.

Mr. A. A. Hamilton and I failed to recognise it, and I sent it to Dr. B. L. Robinson, of the Gray Herbarium of Harvard University, U.S.A., who says that it is *Chondrilla juncea* L., a Mediterranean species of the Cichorieæ (Compositæ), which has become locally established in the middle Atlantic States of Maryland and Virginia.

It is not only a new record for Australia, but it would appear that no *Chondrilla* has been recorded from Australia.

One can quite understand the truth of Mr. Field's description. It is almost as tough as a bundle of wire, and it is going to be one of the most troublesome weeds heard of for some time.

When I originally heard from Mr. Field, and before I knew its name, I wrote : "What you want to do is to avoid letting the plant set seed. The only way to deal with it is by the hoe or mattock, and such a wiry-stemmed plant as this would be worth taking some pains over. I think, otherwise, it is going to stay."

It may have come in dirty seed, one knows not when and how, or quite possibly in the chaff recently imported from the United States. It spreads from the roots and also from the seeds. As stock will not touch it, and as it is so tough, it is not likely to disappear unless it is attacked.

In Ada E. Georgia's "Manual of Weeds" (in America) it is called "Gum Succory," and also "Skeleton Weed" and "Naked Weed," but it is not cited there as a specially bad weed. To destroy, it is recommended : "Hoe-cutting or spudding off the crowns of first-year plants (it is biennial); deep cutting of fruiting stems before any seed matures. In cultivated ground the weeds are destroyed by the necessary tillage."

Its lower leaves are like those of Dandelion, and it has long, thin tough stems without leaves, giving the plant a bare appearance, and hence doubtless the names "Skeleton Weed" and "Naked Weed." The stems are surmounted by small, unornamental yellow dandelion-like flowers.

Farmers in other districts who notice the weed are particularly requested to inform me, as it is of considerable importance to ascertain how far it has spread.—J. H. MAIDEN, I.S.O., F.R.S., F.L.S.

A Hot-water Circulation System of Heating Brooders.

JAMES HADLINGTON, Poultry Expert.

The success of the hot water circulation system of heating chicken brooders where properly installed has been amply demonstrated.

The accompanying plans of a brooder house, brooders, and hot-water system are those in use at the Hawkesbury Agricultural College. In addition, the Grantham Stud Poultry Farm, the Soldiers' Settlement at Bankstown, and many of the leading poultry farmers of this State have put in similar installations, and quite a number of breeders have followed the plans as supplied in the form of blue prints by the Department. Wherever these plans have been faithfully followed, the system has been found to be uniformly successful. But many hot-water circulating systems installed during recent years have not been satisfactory. It has therefore been considered desirable to publish these plans, together with a general description, with the hope that fewer mistakes will be made by poultry farmers adopting this system of brooding.

Mistakes in some Installations.

The principal mistakes made in many brooder installations are—

(1) The brooder house may be too narrow and not allow of sufficient room for the measurements shown in the plan, which have been proved to be essential to successful brooding.

(2) There is insufficient light.

(3) The front of the brooder house is left open.

(4) The heater is too small.

(5) The pipes are too small.

(6) The brooder compartments are of a size or shape other than shown in the plan.

(7) The pipes have been placed at different elevations and in different positions.

The plan here adopted is the outcome of experiment and experience over a number of years, during which time the writer has brought the system to the present stage of efficiency; and it is doubtful if any other system of brooding chickens has proved quite so successful. It has shown itself to be economical, efficient, and labour-saving, and when properly run ensures good development in the young stock.

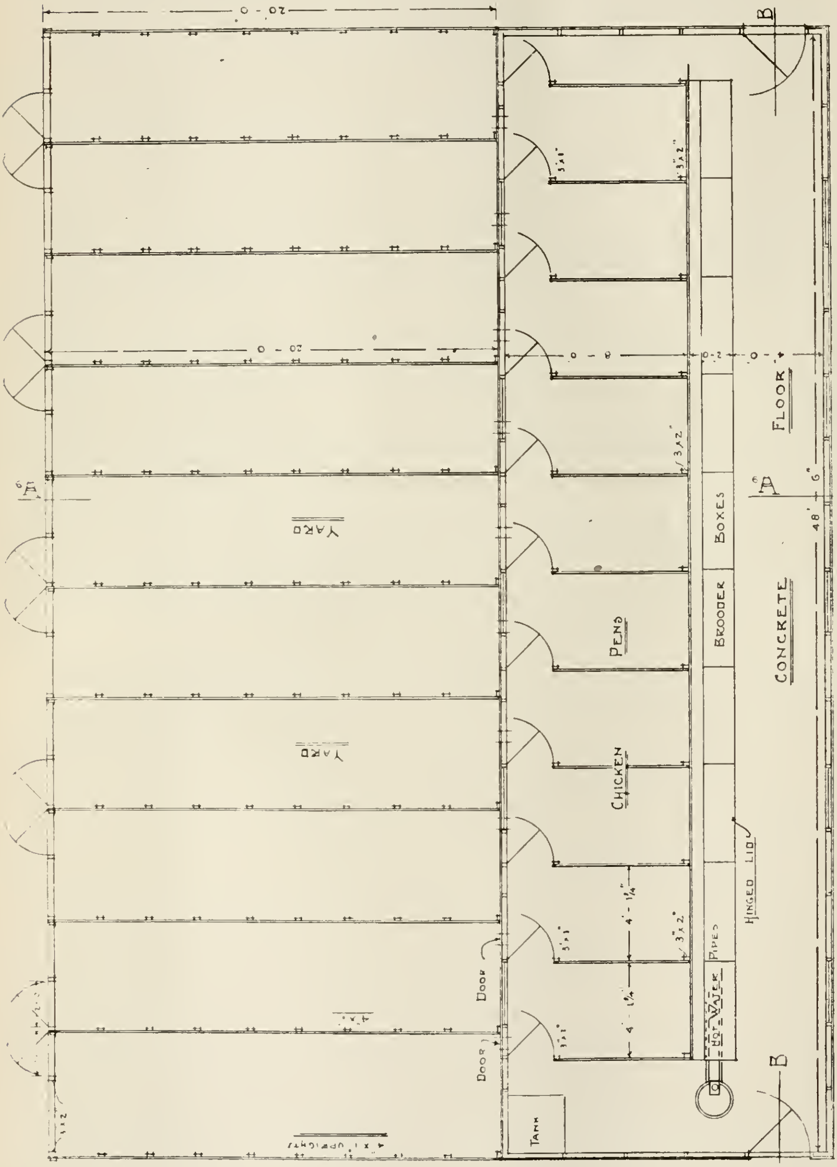


Fig. 1.—General Plan of Frooder House (with outside yards), fitted with Hot-water Circulation.

A Hot-water Circulation System of Heating Brooders

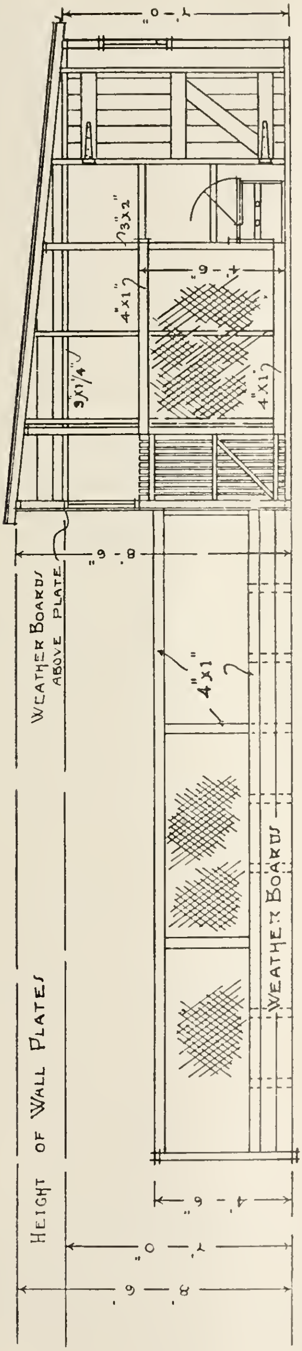


Fig. 2.—Section AA of Fig. 1.

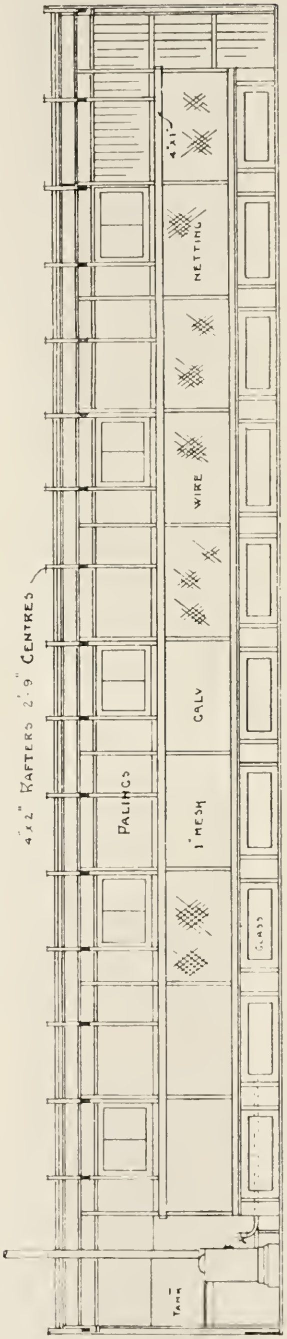


Fig. 3.—Section BB of Fig. 1.

A Hot-water Circulation System of Heating Brooders.

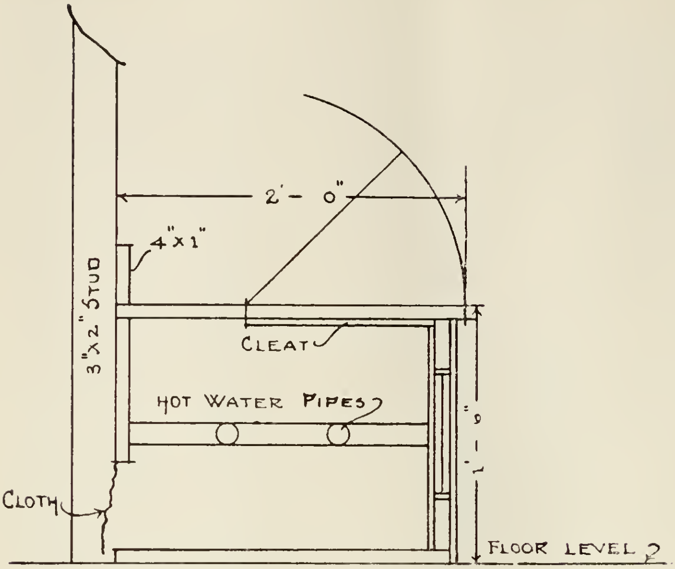


Fig. 4.—Cross Section of Brooder, showing position of Hot-water Pipes.

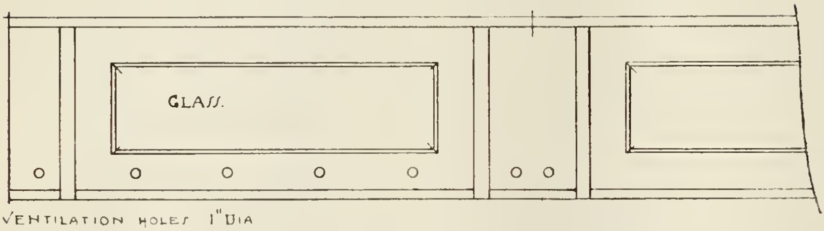


Fig. 5.—Part Elevation of Brooder, as seen from the passage.

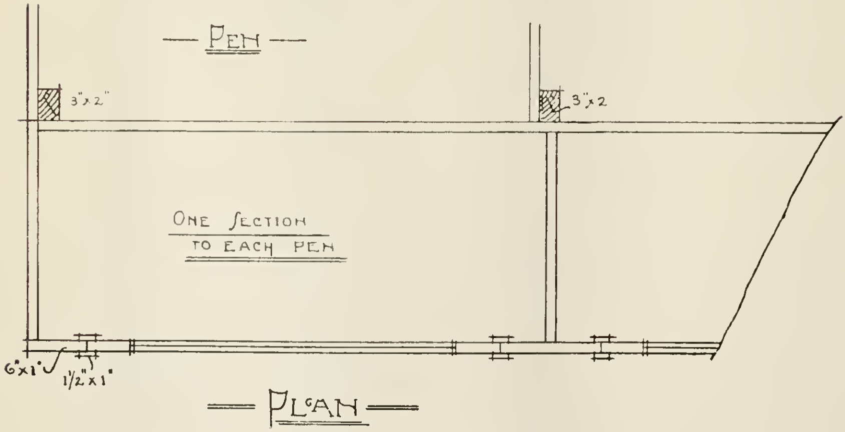
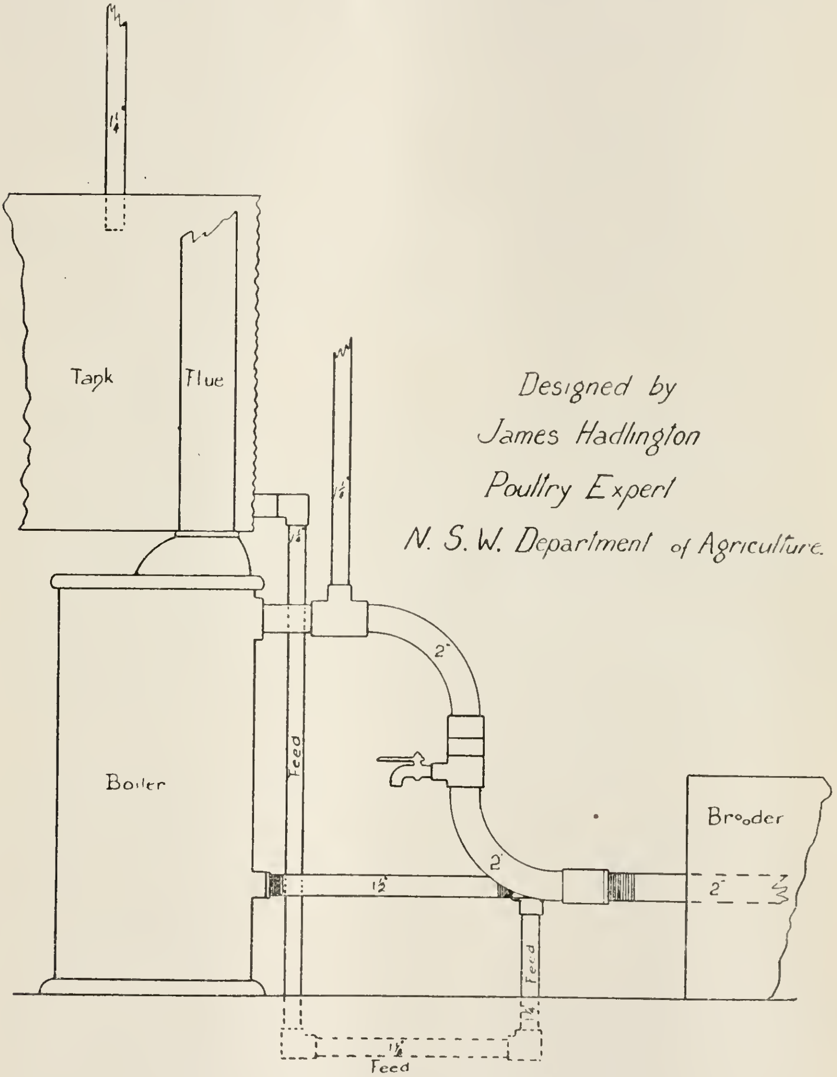


Fig. 6.—Plan of Brooder.

A HOT-WATER CIRCULATION SYSTEM OF HEATING BROODERS.

The Plan.

The plans comprise—(1) The brooder house and outside yards. (2) Construction of brooder compartments. (3) Plans of heating system. In regard to the boiler, which is of the slow combustion type, the one shown in the plan is intended to be merely diagrammatic rather than of any definite pattern. The main consideration in these heaters is their fuel capacity; even a small slow combustion boiler might do the work with constant stoking. What, however, is required is a boiler with a fuel capacity that will enable it to work at least eight hours without attention, otherwise someone will be



Designed by
James Hadlington
Poultry Expert
N. S. W. Department of Agriculture.

Fig. 7.—General Elevation of Hot-water Circulation System.

under the necessity of rising during the night to replenish the fuel. To obviate this, the coke capacity should be not less than 28 lb. Theoretically this might be shown to be excessive, but in actual practice such a margin will be found necessary. In some patterns of slow combustion boilers, where the main body of the boiler is too small to enable it to be run for the required time, resort is had to a supplementary magazine to hold more coke. Many of those in use are so narrow that the coke is found to jamb; the fire burns from underneath, and the heater therefore cools off, perhaps during the night. This is rather a serious occurrence, because then the chickens are liable to get chilled and will crowd together for warmth, very often with fatal consequences. It is, therefore, of some importance that the magazine be of sufficient width to ensure that the coke feeds freely into the heater.

The system shown in the plan differs somewhat from accepted principles of hot-water circulation, owing to the pipes being run on a dead level. The way in which this circulation could be obtained without having the pipes on a gradient was discovered by the writer when first making the attempt to heat brooders on this system some years ago, and it has been in successful operation ever since.

The explanation is simple; the expansion pipe, which is usually situated at the highest point of the gradient in hot-water circulations for other purposes, is in this case placed at the intersection of the boiler and the outgoing flow of water. This is the only way in which the circulation can be obtained with the pipes run on a level, which is a great advantage in brooder house work.

However, it is not the only way; by sinking the boiler below the floor of the brooder house and giving the pipes a slight gradient to the end of the brooders answers very well where there are no objections to the boiler being sunk below the floor. But in many places there are objections to such a plan, particularly where drainage water has to be contended with. To sink the boiler in this way will involve a concrete pit, as it must be completely protected in respect of soakage or flooding.

Suitable Boilers for the Purpose.

Difficulty is at present being experienced in importing boilers; it is therefore not possible to indicate exact sizes and patterns obtainable, but as a guide to those contemplating putting in these installations it may be stated that the size required for a ten to twelve brooder plant would be one equal in capacity to an "Ideal," No. 9 or 10 (Messrs. John Danks and Son), or an "Amateur," No. 4, 4a, or 5 (Metters, Limited). If more than that number of brooders is to be run, a larger size will be required. However, the writer does not favour more than twelve brooders in one house.

It is questionable if this system will pay where less than six brooders are to be used, but where that number and upwards is required there is no cheaper or more efficient method of brooding chickens, taking into account, also, economy of fuel. If a poultry farm is being established for the purpose of making a living, it will be necessary to hatch 1,000 chickens per annum, and to handle these in the season not less than eight brooders, each accommodating 100 baby chickens, will be required.

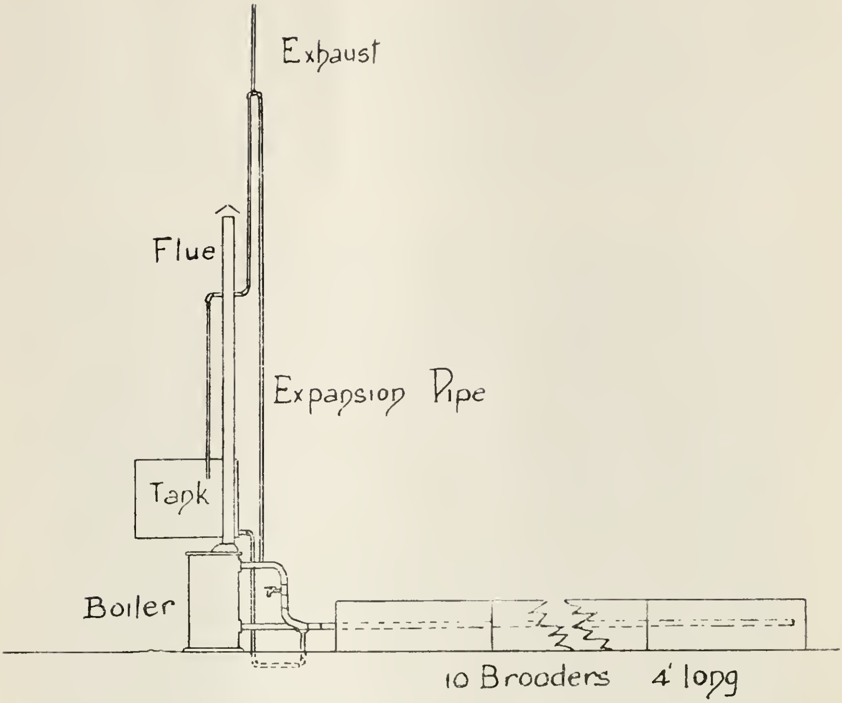


Fig. 8.—Elevation showing details of Exhaust and Flue.

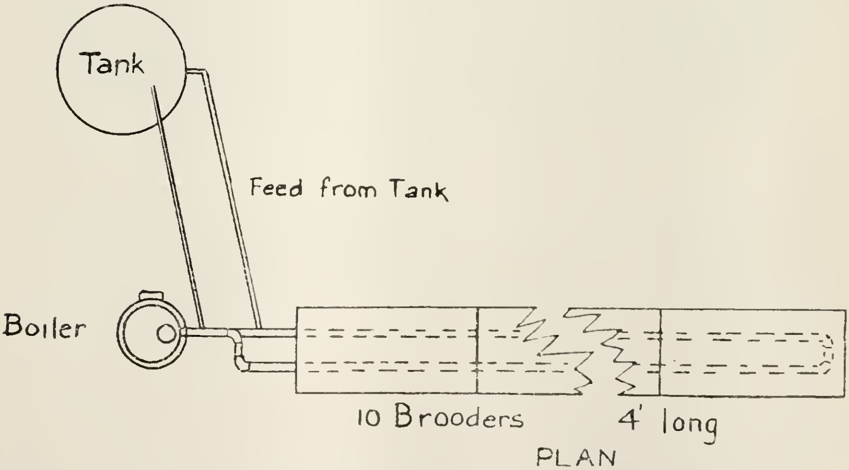


Fig. 9.—General Plan of Hot-water Circulation System, showing location of Tank.

A HOT-WATER CIRCULATION SYSTEM OF HEATING BROODERS.

The Peanut.

[Continued from page 273.]

W. D. KERLE, Assistant Inspector of Agriculture, and Experimentalist,
Hawkesbury Agricultural College.

After-cultivation.

UNDER normal conditions the nuts will germinate in from seven to twelve days; the warmer the soil the quicker the germination, and *vice versâ.* The most critical period of the crop is the first month after planting. Cold wet weather will seriously affect germination, and permanently check the plants unless warm weather comes quickly. For this reason it is often advisable to delay sowing until the danger of unpropitious weather is minimised. In about a fortnight from sowing, replanting should be done where the nuts have failed to germinate; such failures will not occur if shelled and graded seed of good quality is sown in a warm, well-tilled soil.

Cultivation between the rows must be thorough and frequent, from the time the plants appear above ground until the blossom falls and the nuts begin to form or "peg," as it is termed. The land must be kept scrupulously clean, and under no circumstances must the weeds be allowed to grow unchecked; they will not be difficult to control if the soil has been properly prepared at the outset.

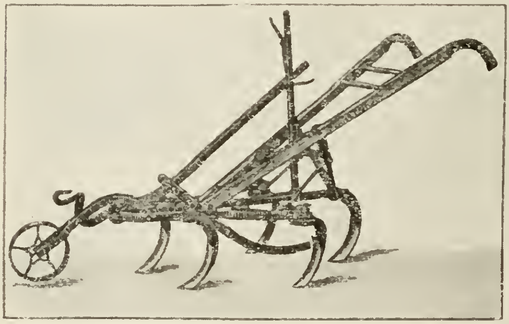


Fig. 11.—The Single-horse Cultivator.

To conserve the moisture during the dry summer months, the cultivator must be employed after every rain of any magnitude to restore the mulch and prevent evaporation. The soil around the plants must be kept loose, particularly when they are coming into flower, so that the pods shall not be stunted in development. It may not be possible to reach with the cultivator such troublesome weeds as Summer grass (*Panicum sanguinale*), Pig weed (*Portulacca oleracea*), Fat-hen (*Chenopodium album*), &c., in which case hand-hoeing becomes necessary. Early and frequent use of the cultivator will ensure the minimum of manual labour. The final cultivation should be given about the time the pods begin to form; the vines will then be almost meeting across the rows in some varieties, and further stirring of the surface will result in checking the development of the pods. The implement best adapted for the cultivation of the growing crop is the single-horse cultivator (Fig. 11). The width and depth of the cultivations can be easily regulated, and side sweeps can be attached for the final cultivation, to throw a small furrow towards the rows ; this provides a loose bed of earth in which the pods will find no difficulty in forming (Fig. 12). In larger areas "straddling" the rows with the ordinary two-horse cultivator (centre tines removed) proves very satisfactory (Fig. 13).

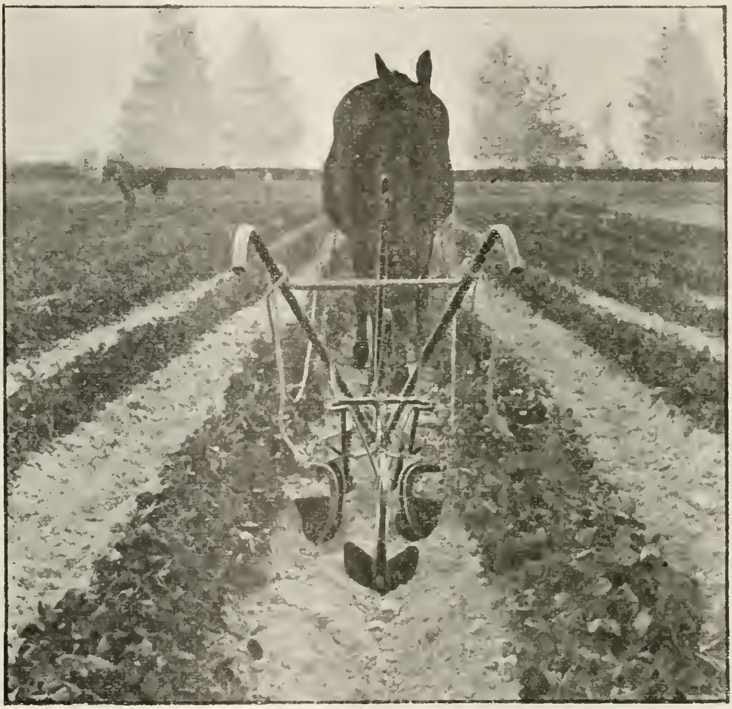


Fig. 12.—Single-horse Cultivator, with Side-sweep Attachments.

Where irrigation is practised, waterings should be given as often as the season demands up to the time the pods begin to form, each irrigation being followed as soon as possible by the cultivator to restore the mulch and loosen the surface soil. Unless the weather conditions become exceptionally dry, applications of water after the stage mentioned are not recommended, since the cultivation necessitated thereby results in injury, due to disturbance of the "pegs."

When to Harvest.

If the season has been favourable and the cultivation thorough, the vines in two to three months from sowing will have met between the rows, and the whole field will have the appearance of a mass of dark green foliage. Later on, it gradually assumes a yellowish appearance—a sure indication that the pods are reaching maturity and that the time of harvesting is approaching.

The nuts mature on the vines unevenly, and if the late maturing nuts are permitted to ripen before digging, the early maturing (and usually the better nuts) will germinate, with consequent bursting of their pods. This particularly applies if rainy conditions prevail. Unfortunately, then, no fixed rule can be given as to the exact time when harvesting should take place, and much is left to the discretion of the grower; the object should be to lift the vines when they possess the maximum number of sound matured nuts. It is advisable to dig and examine a vine from time to time to ascertain the stage of maturity which has been reached.

Generally speaking, harvesting should take place before frosts have occurred, as they greatly reduce the value of the foliage for stock food, injure the kernels for seed, and by decaying the pod stems cause the pods to become detached and difficult to harvest. Under normal conditions the maturity of the plant ranges from 120 to 170 days.

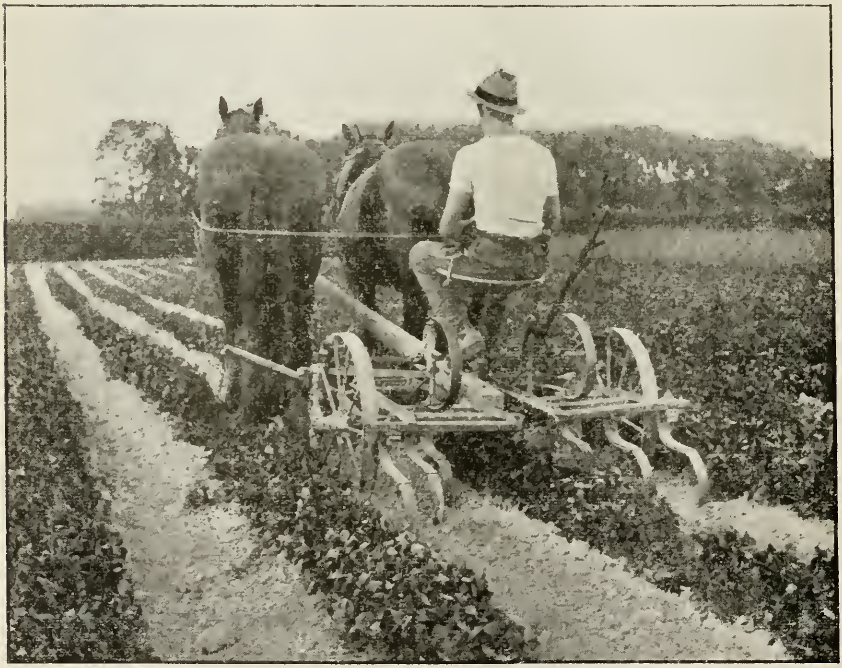


Fig. 13.—Double-horse Cultivator with centre tines removed.

Harvesting Methods.

The peanut crop must be harvested only when the weather conditions are dry and warm. Many methods are employed for lifting the nuts, but any contrivance which will cut the tap-root just below the pods and loosen the soil so that the vines may be lifted, is satisfactory. Methods which remove the main root from the soil are not recommended, for the nitrogen stored in the root tubercles by bacterial activity is then lost, with resultant depletion of soil fertility.

In the United States, machines for digging, cleaning, and windrowing the vines are on the market, and have proved very successful. Some types of potato-digging machines are very suitable for harvesting the peanut crop; that shown in Fig. 14 is an excellent type of digger for the purpose. It can be adjusted to sever the main root just below the pods, the vines being carried by a gently shaking elevator to the rear of the machine, where they are deposited on the ground free from dirt and rubbish. In comparison with the ploughing-out methods frequently adopted, machines of this type economise labour and ensure all the nuts being harvested.

The machine illustrated requires for its draught two to three horses (according to the nature of the soil), and from 6 to 8 acres per day may be harvested. The approximate cost of the machine is £30. Co-operation in the purchase of a digger of this kind might be recommended to growers. Frequently the vines are ploughed out with a single-furrow plough fitted with a digger type of mouldboard. This method results in partial exhaustion of the soil nitrogen, consequent on the removal of the nodule-bearing tap-roots, and also in a loss of nuts by unavoidable detachment from the vines. Improvement in this method may be effected by lifting with an ordinary plough from which the mould-board has been removed, or by attaching a specially made sword-like cutting shear about 4 inches wide and 16 inches long, which is made to pass under the pods, thus severing the tap-root. Cutting knives may be attached to the two adjustable side standards of a Planet Jr. cultivator, which is then driven along the row, the knives cutting the tap-root and allowing the vine, with the nuts attached, to be lifted with a fork.

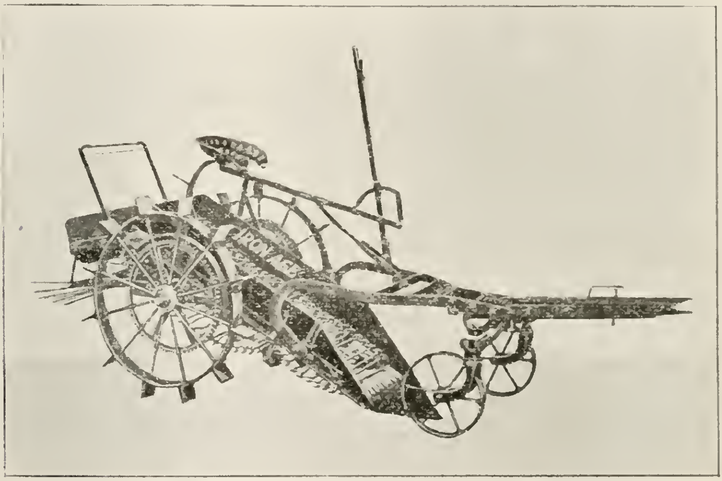


Fig. 14.—One form of Potato Digger which is suitable for Harvesting Peanuts.

Curing.

The vines, after the lifting implements have gone through the crop, are pitchforked into windrows, usually three rows in one, where they are left for a few hours to wilt, to make certain that a minimum of external moisture is present, thus preventing mildew and consequent discoloration of the pods. The usual practice is to stack in the afternoon the vines windrowed in the morning, and the following morning—after the dew is off—those harvested the previous afternoon are stacked.

The length of time they are left in the windrows will depend on the weather conditions, but they must be quite dry before stacking. In some districts where harvesting is early and is conducted during hot weather, the vines may be stacked without having been previously put into windrows. The vines and nuts are cured in the field in carefully-made stacks in preference to barn curing, as they dry quicker and produce a brighter sample of nut and much superior hay. The curing stacks must be made of such a size and in such a manner as to ensure quick drying by free circulation of air, and should be protected from the weather. The method of curing found to give the most satisfactory results in the United States is as follows* :—

The stacks or cocks are built around stakes set firmly into the ground to a depth of 12 inches to 14 inches, and placed in rows in the field or, if more convenient, in groups of four to ten. The stakes are 7 feet in length and 3 inches or 4 inches in diameter. Both ends are sharpened, and two pieces of lath about 18 inches in length are nailed at right angles to the stake, about 8 inches from the ground, or high enough to prevent the vines from coming in contact with the soil. The vines are laid round the stake in even layers, with the pods kept well to the centre against the stake and the vines to the outside. In order to tie the stack together, a few vines are occasionally hung around the stake. On reaching the top a bunch of vines is rolled together and pressed down over the point of the stake to form a cap. Frequently the stack is capped with dry straw, grass, &c., to keep off water should rain fall. Stacked in this manner, free circulation of air takes place and the drying is completed. If the stacks are carefully constructed, the nuts and vines will not suffer any material injury if rain falls, unless it keeps up for several consecutive days.

This method of curing is applicable to our conditions of climate. The stacks and cocks could be made larger, and capping in normal seasons could be almost dispensed with. Modifications of this method, suitable for his particular district and the trade requirements, will suggest themselves to the intelligent farmer. Any method that will dry the nuts sufficiently to prevent heating and obviate the formation of moulds will be effective when harvesting for sale to manufacturers of peanut oil.

The length of time the vines will take to cure will depend on the climatic conditions. In hot windy weather the nuts will be fit for picking in eight to fourteen days ; too quick drying is apt to cause shrivelled and dull pods. On the other hand, if the weather is dull and moist, the drying will be much slower. Normally the curing process extends from fifteen to twenty-five days. Fitness for picking and bagging is indicated by the pods being perfectly dry and the nuts firm. Bringing them in too soon, or allowing the nuts to become even slightly moist, will cause moulding in the bags or in the storage bins, and render the product practically unsaleable. This risk can be considerably minimised if the pods are stored in cribs similar to those provided for maize.

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* Farmers' Bulletin 431, U. S. Dept. of Agri.

Picking and Cleaning.

Picking the nuts from the vines is slow and tedious work, and a big item of expense to the grower. In the United States hand-picking is done by negro labour, principally women and children, and consequently at a low price per bushel. In Australia, since cheap labour is not available, a decided impetus will be given by the adoption of mechanical pickers. Several satisfactory machines are on the American market, with capacities varying from 200 to 300 bushels per day. In those giving most satisfaction, the nuts are removed by brushes operating on the under side of a horizontally-placed wire gauze, over which the vines slowly pass. Other such labour-saving devices are constructed on the ordinary grain thresher cylinder principle, but they are apt to crack the shells and injure the kernels unless revolved at a low speed. Most machines remove the small pod stems, and possess an ordinary winnowing arrangement.

If hand-picking has to be adopted, the vines when thoroughly cured can be kept in well-ventilated barns, and picked at the grower's convenience. Well-cured nuts will keep for years without serious deterioration if placed in bags and stored in a dry, cool, well-aired barn. In hand-picking, or with suitable machine-pickers, the nuts are to a certain extent cleaned. This cleaning, however, is quite insufficient if the nuts are for roasting or confectionery purposes. Factories have been established in the United States, fitted with modern cleaning, polishing, and grading apparatus, and these factories are usually the grower's market. The farmer has but to bag the nuts and consign them to such factories when the market is favourable. The bags are usually made to hold 80 lb. to 100 lb. During bagging and transportation, due care must be taken to prevent breakage and consequent lowering of value. On arrival at the factory the peanuts are first weighed and graded according to colour and size, each grade being deposited in a special hopper, whence they are elevated to the top floor of the plant to pass through stemming machines. High-geared suction fans then lift the light-weight nuts and carry them to shelling machines, while the heavy, well-filled nuts pass into cylindrical drums, where they are subjected to a constant agitation until the shells attain a high polish. Then they are again fanned and transported to cylindrical graders, where separation occurs according to size; the nuts are finally distributed over slowly-moving tables, where skilful hand-pickers sort out the undersized and irregular-shaped nuts that have accidentally passed through the mechanical graders. From here they gravitate to the bottom floor, are bagged and consigned to storage warehouses.

Shelled nuts are handled in a similar manner, except that shelling occurs before their passage into the mechanical graders.

(*To be continued.*)

Plants which Produce Inflammation or Irritation of the Skin.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens.

1. Dr. J. B. Cleland, Principal Microbiologist of the Board of Health, Sydney, gives me the following note :—

"*Dermatitis from handling Noogoora Burr.*—Dr. Hittmann, of Wee Waa, has informed me that about February, 1917, after the extensive floods of the Namoi River, a number of men were engaged in cutting down this burr and other noxious weeds in proximity to the river banks. Five cases of a weeping eczema or dermatitis occurred in his practice during this period, three being in burr-cutters and two in fisherman tramps who camped under the bridges of the river amongst the burrs in following their occupation. In January, 1918, the river was again in flood. Two cases of this same dermatitis again occurred, both being in burr-cutters, one of whom had been infected in a similar way in 1917. In the previous year this man had come in with a dermatitis, had been cured, and had then worked again amongst the burrs and was reinfected. The persons attacked attribute the complaint to this particular burr."

The Noogoora Burr is *Xanthium strumarium*, and a figure and some notes on the weed will be found in this *Gazette* for 1899, page 1043.

2. Recently in Tasmania my attention was drawn to the fact that skin irritation befalls the hop-pickers when gathering the hops, and a man to whom I spoke stated that he cannot follow the occupation for that reason. He added that few people suffer as he did. Other people informed me as to the occurrence of "hop-rash," but I did not see a case.

On speaking to Mr. W. Grant, Superintendent of the Outer Domain, who has had a good deal of experience with the hop-plant in England, he said that the hop-rash was well known to him, and he attributed it to the rough hairiness of the bine (the stem), which mechanically abraded the skin.

The Hop is *Humulus lupulus* L., and the scales of the fruit (the hops) are, when ripe, covered with yellow glandular hairs, which secrete a bitter principle called lupulin, and it may be that these hairs, getting into the circulation, cause this irritation.

3. The Stinkwort, *Inula graveolens* (for a general description of this weed see this *Gazette*, July, 1917, p. 493). Unfortunately this weed, which is such a notorious pest in South Australia, is becoming increasingly abundant in New South Wales, and the following phase of it is very little known in our State. Following is the first published reference known to me.

In the *Journal of the Bureau of Agriculture of Western Australia* for 30th June, 1897, p. 1312, is an account by the late Mr. R. Helms of the distressing symptoms of inflammation of the skin undergone by him after handling Stinkwort flowers, and there is also a note that it is reputed that sheep and horses running amongst Stinkwort may suffer similarly. Mr. Helms attributes the irritation to the barbs of the pappuses; it may be that the real irritant is the aromatic resinous oil which permeates the plant.

A good many landowners have put men on to pull up Stinkwort, and one hears of such experiences as the following from time to time. The following is from the Wagga district in June, 1917:—

"Poisoning symptoms have manifested themselves in the cases of several men who were engaged in the eradication of Stinkwort. In one case the sufferer was in a hospital for a week. Some time after he had been helping in the eradication of Stinkwort his arms began to swell, and one eye and a knee were also affected. The use of gloves is considered advisable to prevent contact of the weed with the skin."

A correspondent in the Harden-Cootamundra district wrote as follows in April of the present year:—

"I would also like to know if you are acquainted with the fact that men who pull this weed with their hands suffer from a form of blood-poisoning about the arms and face, and sometimes even under the clothing. I have a man here who put in a week or ten days pulling this weed, and he is now laid up suffering from this about his arms, face, and neck. This is the second case which has come under my notice. I saw a man here last autumn who had lost all the skin from his hands, arms, face, and neck, which he said was due to Stinkwort poisoning."

No man should pull up Stinkwort without leather gauntlets. As with most irritant plants, it is found that some men are immune or nearly so, while others are more or less susceptible. With gauntlets the risk is reduced to a minimum, but care should be taken to keep the gloves in repair, as it is wonderful how insidious the poison is. A common remedy is to dab a damp rag on carbonate of soda or washing soda; this usually gives relief, and in bad cases medical aid should be sought. The annoying part of the trouble is that it is most persistent, and in bad cases may distress a sufferer for weeks and even months.

4. *Senecio Hectori* J. Buch., from the West Coast of New Zealand, belonging to the same family, was also recorded by Mr. Helms as causing skin irritation.

My readers will remember that *Olearia viscidula* Bth., also from the same family (Compositæ), and also with a sticky surface, also causes severe irritation of the skin. (See this *Gazette* for July, 1913, p. 911.)

One must be careful in collecting evidence that seems to indicate that a plant is an irritant to the skin. In the series of papers on this subject which have appeared in the *Gazette*, it must be borne in mind that the irritating substances referred to (oil, glandular hairs, oxalates, &c.) are parts of the plant itself. But many plants are mere accumulators of dirt, which may cause irritation to broken skin. No one would accuse a rose-bush of being a poison plant, but I have known many cases of people engaged in pruning, or even plucking a rose, getting irritating sores, sometimes very severe, through an old thorn which had accumulated filth, by means of the dust of the air, tearing the skin and inoculating the wound with dirt at the same time.

Farmers' Experiment Plots.

GRAIN SORGHUMS IN THE NORTH-WEST.

R. W. McDIARMID, Inspector of Agriculture.

DURING the past season the grain sorghums were under trial at the following centres in the North-west :—

Wee Waa, Mr. J. J. Treloar.
Inverell, Mr. A. J. Simpson.

The first month or six weeks after planting was very wet, and this caused loss of plants through the accumulation of surface water, and consequently the stand was thin. This was particularly noticeable at Inverell. The plants at each centre made very good growth and stooled very well.

The soil at Wee Waa was new land, which had been broken up only a few weeks prior to sowing. It was representative of the dark soil which predominates in the district. At Inverell the soil was of the red loamy class common to the locality, and had been under cultivation for some time. Sowing was carried out with the ordinary wheat drill by blocking out some tubes to space the rows about 3 feet apart. No fertiliser was used. The amount of seed sown ranged from 5 lb. to 6 lb. per acre, according to the size of the seed and its freedom in running through the drill.

At each place the ordinary fodder sorghums were included for comparative purposes, but the season was rather better than usual, as regards rainfall, and they naturally made more prolific growth than would otherwise have been the case. In each instance the grain production of the grain sorghums was better than that of the others, notwithstanding the more prolific growth made by the fodder varieties.

The experimenters report that stock were fond of the grain and also of the stalks while green, but not when they become properly matured. Pigs were exceptionally fond of the crop at Wee Waa, and some difficulty was experienced in keeping them out once they tasted the grain.

The results obtained are given below, and they must be considered very satisfactory and promising, considering the circumstances under which the crops were grown. The germination was materially affected at each place, and a plague of grasshoppers settled on the plots at Wee Waa. The early varieties escaped their ravages to some extent, but the late ones, particularly Kafir, were completely eaten out before the heads appeared from the leaf sheath. They left nothing but the mid-rib of each leaf standing, and in more than half the crop not even the stalk remained. The earlier maturing varieties were practically ripe when attacked, and were apparently not relished by the grasshoppers as feed.

The experimenters are both well pleased with their venture, and maintain that much better results are possible with better germination, and immunity from outside pests. The plants vary considerably in each variety, and with careful selection for a few years there appears to be every prospect of much better returns.

The following yields were harvested per acre at Inverell, and estimated at Wee Waa:—

Variety.	Inverell.	Wee Waa.
	bus.	bus.
Kafir	30	Nil.
Milo	21	30
Kaoliang	19	30
Feterita	24	40
Early Amber Cane	14	35
Sorghum saccharatum	12	Not sown.

The early maturing varieties—Feterita, Kaoliang, and Milo, in the order mentioned—appear to be the most likely ones for the north-west and dry portions of the State, for they not only mature more quickly and ripen during the summer rains, but are in consequence less liable to grasshopper attack. Possibly birds would also be more troublesome to the late maturing ones through other grain becoming less plentiful.

AWARDS FOR GOVERNMENT CATTLE.

In the competitive sections at the Royal Agricultural Society's Show, the Department of Agriculture won four third and two second prizes in very strong classes, which is very encouraging, considering the very short period for preparation allowed at the time when it was decided to compete.

At the Easter sales the Milking Shorthorn yearling bull Sir Gibson of Berry (bred by the Department) brought 160 guineas, being the second top price in his section; while the Holstein bull Captain Muller (also bred by the Department) brought 165 guineas, the top price in his section.

At other shows and sales the cattle sold and bred by the Department have also come to the fore. Robert Gibson of Berry in the Yearling Class for Milking Shorthorns was second at Kiama, first at Berry, and first at Nowra, while he secured third place in a class of seventy-five young bulls at the Royal, all won in 1918. This bull was afterwards sold for 160 guineas, the first prize bull in his class bringing 90 guineas, and the second prize bull 60 guineas.

The yearling bull Hughes of Berry, sold to Mr. J. James, of Bexhill, won first prize in the yearling class at Kiama, beating Robert Gibson of Berry; thus two bulls bred by the Department were first and second at this show.

At Berry the winning two-year-old Milking Shorthorn bull was also bred by the Department.

At the North Coast shows the Guernseys bred by the Department were prominent in the prize ring. The two-year-old bull General French won First and Champion at Coraki, and was beaten by one point for the Grand Champion. He also won First Prize and Champion at Bangalow and Alstonville shows.

In Ayrshires, the cow Trilby II won First Prize and Reserve Champion at Lismore.

At Camden, in the Holstein section, the bull bred by the Department, Captain Muller, won First and Champion, also Grand Champion, all breeds; and at the 1918 Royal he won First and Reserve Champion—Holstein bull—beating the crack New Zealand bull Hengervelde, and, as already stated, was subsequently sold for 165 guineas.

Egg-laying Tests at Hawkesbury Agricultural College.

[Under the Supervision of James Hadlington, Poultry Expert.]

SIXTEENTH YEAR'S RESULTS, 1917–18.

E. F. WHITBREAD, Organising Secretary.

THE figures for the egg-laying competitions concluded at Hawkesbury Agricultural College on Sunday, 31st March, 1918, are highly satisfactory, and might be said to be, on the whole, practically equal to the excellent results recorded for the previous year. Additional and convincing testimony is thus furnished as to the value of the single-pen system, and of the information about poultry-raising disseminated in recent years by the Poultry Expert of the Department of Agriculture. The soundness of the advice afforded is certainly reflected in the consistent improvement of the past few years in the general laying of the birds in the competitions. Apparently poultry farmers are awakening to the fact that it is useless for them to enter the field of competition unless their stock is bred on correct lines. The more this is realised, especially by those whose birds still show room for improvement, the greater the benefit will be to the poultry industry generally.

The high average of the heavy breeds in the First-year Section is worthy of special notice, as it constitutes a record for the tests. Although during the past year the light breeds did not maintain the high standard of production recorded in the previous twelve months, still, their laying was very creditable. As regards the tallies of the birds in the second year, the light breeds put up much better scores than the heavy breeds.

For the first three months of the competition the weather was very severe, frosts being particularly numerous. In all probability this accounted to a great extent for the diminished egg production during those months. It will be noticed that the total value of the eggs for the year is somewhat smaller than last year. This is accounted for by the fact that fewer eggs were laid during the winter months, when the highest prices are obtainable.

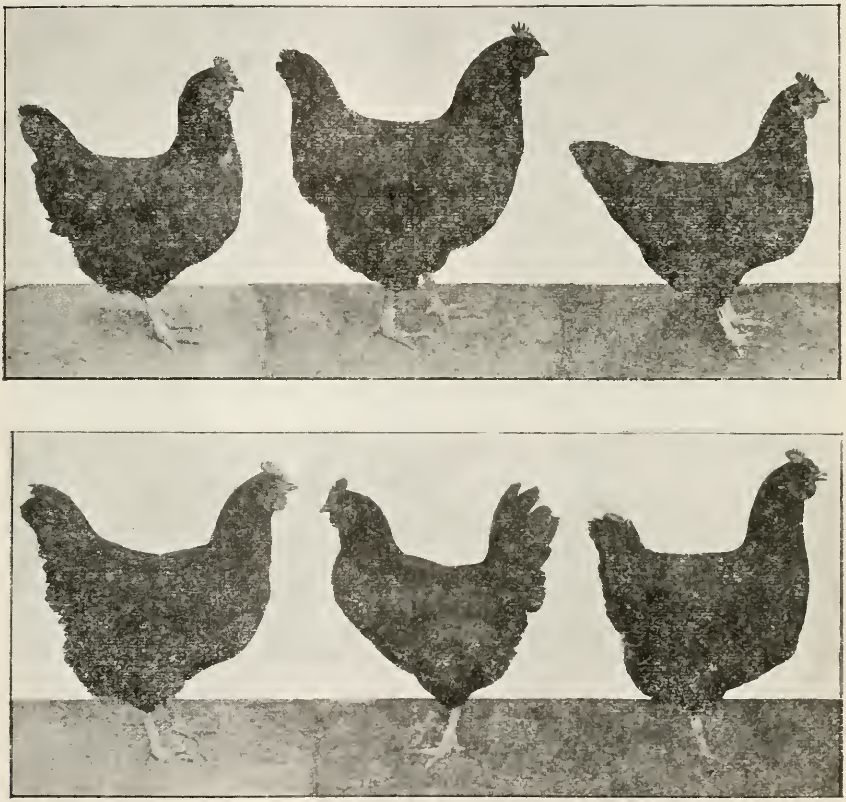
A study of the accompanying tables will show that in the past year there has again been an improvement in the laying of the birds lowest on the lists. This in itself points to the general laying standard having been improved, and is very gratifying. The maximum laying in the competitions is reaching a stage at which we must in future look to improved minimum production as the way in which the averages are more likely to be increased.

With a view to obviating the disadvantage to competitors who lose a bird in the competitions, average prizes for groups of six or five birds have been awarded for the past year. The reason for groups reduced to less than five birds not being eligible for prizes is that it is considered that in such cases there is every possibility of the deaths being due to lack of stamina.

Second-year Hens.

This was the first year in which the second year hens were tested in two sections—light and heavy.

Last year, it will be remembered, a record as regards the two years' test was established, the tallies of the leading group of six birds being 2,647 eggs, of which 1,231 were laid in the second year. This is overshadowed by the figures now to the credit of Mr. J. M. Weaver's hens, viz., 2,672 eggs for two years, 1,146 of which were laid in the second year. The total value of the eggs from this pen was £14 4s. 2½d.

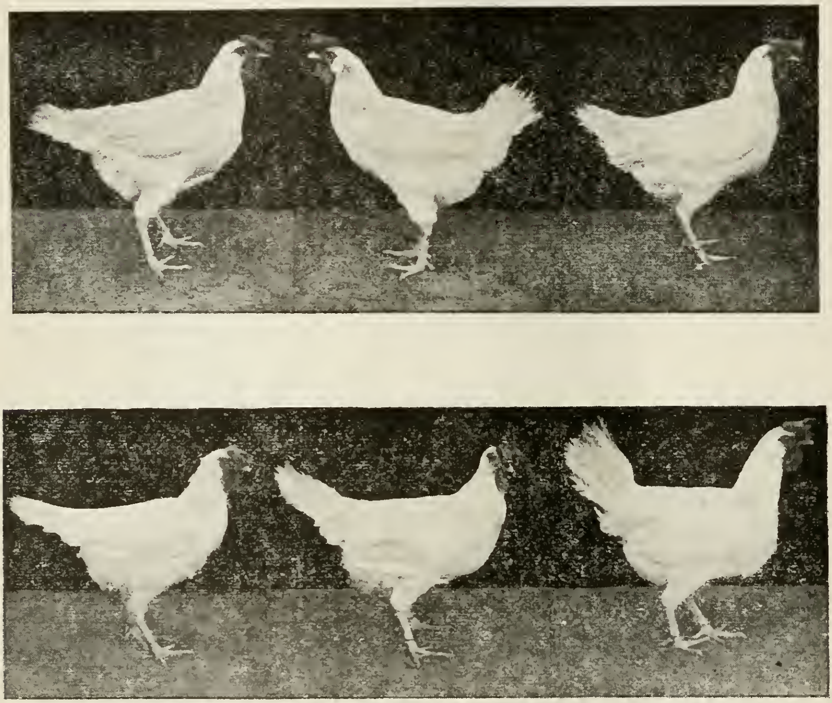


Mr. C. Judson's Black Orpingtons.

These laid the greatest number of eggs (1,613) in Section B (Heavy Breeds) for groups of six birds, and also won the Quality Prize for Heavy Breeds. In addition, the top left-hand bird won the prize for greatest number of eggs during twelve months in Section B, viz., 312 eggs; the adjoining bird winning the second prize with 305 eggs.

It might be mentioned that individual birds belonging to the following competitors produced over 500 eggs each for the two years, namely:—J. M. Weaver (White Leghorn), No. 431; W. F. Elliott (White Leghorn), No. 422; E. Kennedy (White Leghorn), No. 464; Mrs. H. Snowden (White Leghorn), Nos. 452 and 453.

The averages for the light breeds were 241 for the first year and 164 for the second year; and for the heavy breeds, 210 for the first year and 131 for the second year. If we combine the figures of both sections for the purpose of comparison, it will be found that the averages for first and second years are 226 and 147 respectively. The previous highest averages were 213 and 165 respectively, so it can be seen that the standard of production over the two years has been maintained.



Mrs. M. Chalmers' White Leghorns.
Winners—with 1,525 eggs—of First Prize for greatest number of eggs laid during twelve months (groups of six birds) in Section A—Light Breeds.

First-year Section.

SECTION A (LIGHT BREEDS).

The average per bird in this section was 209 eggs, which is a little short of last year's record, but well ahead of the figures of preceding years, which included both light and heavy breeds.

The highest total in this section is that of Mrs. M. Chalmers' group of White Leghorns, which laid 1,525 eggs, of a value of £8 6s. 2¼d. Only on two previous occasions has this total been exceeded. With the exception of one group, all in this section reached the 1,000 mark.

SECTION B (HEAVY BREEDS).

Last year it was pointed out that the average of 192 eggs per bird for this section was the more creditable in that it equalled the previous highest average for combined light and heavy breeds. During the year just closed the hens in this section put up an average of 202 eggs each, and from the table of monthly laying it will be seen that this fine average cannot be attributed to any outstanding winter laying of these breeds, which is rather interesting.

The leading group is Mr. C. Judson's Black Orpingtons, whose total is 1,613 eggs, of the value of £8 12s. 3¼d. This average of 268 eggs per hen is a splendid performance; and the total of 312 eggs by one of the birds just equals the record put up by Mr. P. C. McDonnell's bird last year. The group total of 1,613 greatly exceeds the previous highest, viz., 1,541 eggs.

Only two groups in this section failed to lay 1,000 eggs, as against four groups last year. The lowest score of any one group this year was 931 eggs, which is considerably better than the 749 of last year.

The Executive Committee.

The personnel of the Committee which controlled the Competition is as follows:—

Messrs. H. W. Potts (Principal, Hawkesbury Agricultural College), James Hadlington (Poultry Expert, Department of Agriculture), A. L. Wyndham (Poultry Instructor, Hawkesbury Agricultural College), W. H. Forsyth, G. White, J. F. Dalrymple (Competitors' Representatives), and E. F. Whitbread (Department of Agriculture), Organising Secretary.

Weight of Eggs.

In accordance with the regulation governing the weight of eggs, the following birds were disqualified for prizes for the year:—

Disqualifications for Individual Prizes.

Section A.

S. McIllwraith (Bird No. 26); C. C. Kennett (No. 34); L. Bulluss (No. 81); A. Duffield (No. 87); J. J. McKenna, jun. (No. 106); D. Kennedy (No. 112); A. Windeyer (No. 150); L. Graham (No. 160); W. Maskell (No. 184); Mrs. G. Reed (No. 202)—White Leghorns. F. J. Morison (No. 219); Pert & Dunn (Nos. 229 and 231); C. Banks (No. 240)—Chinese Langshans.

Section B.

H. Bastin (No. 244), Croad Langshan. G. Howell (Nos. 271, 272, 274, and 276), Silver Wyandottes. Mrs. C. Ferguson (Nos. 290 and 294); J. H. Madrers (No. 305)—Rhode Island Reds. J. T. Brett (Nos. 346 and 348); A. Benson (No. 413); A. M. Simpson (Nos. 416, 417, and 418)—Black Orpingtons.

Disqualifications for Group Prizes.

Section B.

G. Howell (Nos. 271 to 276), Silver Wyandottes. A. M. Simpson (Nos. 415 to 420), Black Orpingtons.

For the ensuing competition, a stipulation has been made that in order to be eligible for individual prizes the eggs of birds must attain a weight of 2 oz. each before the expiration of the first six months of the competition. Any groups the eggs from which do not attain an average of 24 oz. per dozen before the end of the first six months, shall be ineligible for group prizes. Prizes for the first quarter will be awarded irrespective of the weights of the eggs.

Mortality and Disease.

The numbers of deaths and replacements in each section during the twelve months is given below. It will be seen that the rate of mortality and disease has not been abnormal.

	Birds replaced.		Birds not replaced.
	Deaths.	Sickness or other cause.	Deaths.
First Year—			
Section A	1	1	10
,, B	...	1	6
Second Year—			
Section D	...	...	5
,, E	...	...	3

The Financial Side.

The feed bill for the 540 birds in the first and second year sections was £199 13s. 5d., or an average of 7s. 4d. per head. After deducting freight and other charges, the net value of the eggs was £537 11s. 4d., the balance being £337 17s. 11d., which is equal to 12s. 6d. per hen over and above the cost of feed.

For the purposes of comparison, the cost of feeding has been estimated as follows :—

	s.	d.	
Second year, Sections D and E	6	6	per hen.
First year, ,, A and B	7	8	,,

SECOND YEAR HENS.

Section D.—Market value of eggs laid, £46 16s. 6d., less cost of feed, £19 10s., leaving a balance of £27 6s. 6d., or 9s. 1¼d. per head.

Section E.—Market value of eggs laid, £38 5s. 10½d., less cost of feed, £19 10s., leaving a balance of £18 15s. 10½d., or 6s. 3d. per head.

FIRST YEAR HENS.

Section A.—Market value of eggs laid, £261 17s. 5¾d., less cost of feed, £92, leaving a balance of £169 17s. 5¾d., or 14s. 1¾d. per head.

Section B.—Market value of eggs laid, £190 11s. 5¾d., less cost of feed, £69, leaving a balance of £121 11s. 5¾d., or 13s. 6d. per head.

PRIZE WINNERS.

Two Years' Competition.

SECTION D.—LIGHT BREEDS.

Greatest number of eggs in the second twelve months (groups of six birds).—(1) J. M. Weaver, White Leghorn, 1,146 eggs, £1 ; (2) S. H. K. Champion, White Leghorn, 1,095 eggs, 10s.

Greatest number of eggs in the second twelve months (individual hens).—(1) W. F. Elliott, White Leghorn (bird No. 422), 257 eggs, £1 ; (2) J. M. Weaver, White Leghorn (bird No. 432), 225 eggs, 10s.

Greatest number of eggs in two years (groups of six birds).—(1) J. M. Weaver, White Leghorn, 2,672 eggs, £2 ; (2) S. H. K. Champion, White Leghorn, 2,589 eggs, £1.

Greatest number of eggs in two years (individual hens).—(1) J. M. Weaver, White Leghorn (bird No. 431), 518 eggs, £1 ; (2) W. F. Elliott, White Leghorn (bird No. 422), 512 eggs, 10s.

Highest averages for two years (groups of six or five birds).—(1) W. F. Elliott, White Leghorn (five birds), average per hen, 494 eggs, £2 ; (2) Mrs. H. Snowden, White Leghorn (five birds), average per hen, 488 eggs, £1 10s. ; (3) J. M. Weaver, White Leghorn (six birds), average per hen, 445 eggs, £1.

Quarterly prizes (groups of six birds):—

1st April to 30th June, 1917.—(1) W. F. Elliott, White Leghorn, 129 eggs, £1 ; (2) Hillcrest Poultry Farm, White Leghorn, 124 eggs, 10s.

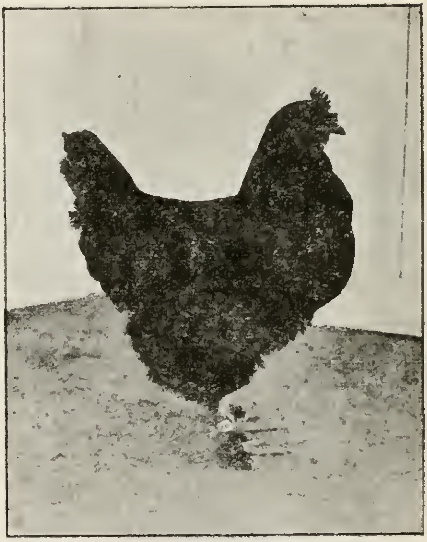
1st July to 30th September, 1917.—(1) J. M. Weaver, White Leghorn, 364 eggs, £1 ; (2) J. R. Stewart, White Leghorn, 359 eggs, 10s.

1st October to 31st December, 1917.—(1) S. H. K. Champion, White Leghorn, 399 eggs, £1 ; (2) J. M. Weaver, White Leghorn, 390 eggs, 10s.

1st January, 1918, to 31st March, 1918.—(1) S. H. K. Champion, White Leghorn 297 eggs, £1 ; (2) Mrs. Snowden, White Leghorn, 295 eggs, 10s.

Mr. W. F. Elliott's White Leghorn.

Greatest number of eggs (257) in second twelve months (individual hens) in Light Breeds.



Mr. A. E. Brown's Chinese Langshan.

Laid 288 eggs in twelve months—the highest total in the Light Breed Section.

SECTION E.—HEAVY BREEDS.

Greatest number of eggs in the second twelve months (groups of six birds).—(1) E. J. Kinney, Silver Wyandotte, 929 eggs, £1 ; (2) R. Whitelaw, Plymouth Rock, 914 eggs, 10s.

Greatest number of eggs in second twelve months (individual hens).—(1) R. Whitelaw, Plymouth Rock (bird No. 522), 219 eggs, £1 ; (2) E. J. Kinney, Silver Wyandotte (bird No. 531), 205 eggs, 10s.

Greatest number of eggs in two years (groups of six birds).—(1) Christie & Son, Black Orpington, 2,244 eggs, £2 ; (2) T. J. Earl, Black Orpington, 2,204 eggs, £1.

Greatest number of eggs in two years (individual hens).—(1) T. J. Earl, Black Orpington (bird No. 496), 473 eggs, £1 ; (2) Christie & Son, Black Orpington (bird No. 485), 472 eggs, 10s.

Highest averages for two years (groups of six or five birds).—(1) Christie & Son, Black Orpington (five birds), average per hen, 444 eggs, £2; (2) T. J. Earl, Black Orpington (six birds), average per hen, 367 eggs, £1 10s; (3) R. Whitelaw, Plymouth Rock (six birds), average per hen, 366 eggs, £1.

Quarterly prizes (groups of six birds):—

1st April to 30th June, 1917.—(1) E. F. Thomson, Plymouth Rock, 169 eggs, £1; (2) W. H. Forsyth, Silver Wyandotte, 162 eggs, 10s.

1st July to 30th September, 1917.—(1) C. E. Warren, Black Orpington, 299 eggs, £1; (2) R. Hardcastle, Black Orpington, 287 eggs, 10s.

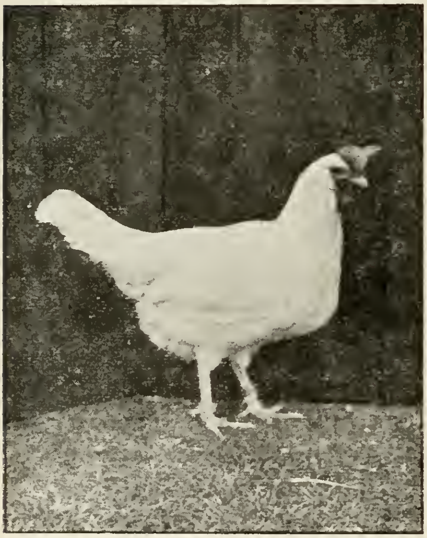
1st October to 31st December, 1917.—(1) R. Whitelaw, Plymouth Rock, 328 eggs, £1; (2) E. J. Kinney, Silver Wyandotte, 319 eggs, 10s.

1st January, 1918, to 31st March, 1918.—(1) R. Whitelaw, Plymouth Rock, 236 eggs, £1: (2) R. Hardcastle, Black Orpington, 233 eggs, 10s.

SPECIAL PRIZES.

Special prize of £5 5s. (or trophy to value) for greatest number of eggs in two years (groups of six birds), without replacement of a bird.—J. M. Weaver, White Leghorn, 2,672 eggs.

Special prize of £3 3s. (or trophy to value) for greatest number of eggs in two years (individual hen).—J. M. Weaver, White Leghorn (hen No. 431), 518 eggs.



Representative Bird in Mr. J. M. Weaver's Winning Pen of White Leghorns for greatest number of eggs in the Second twelve months (groups of six birds) in Section D—Light Breeds.

Total number of eggs, 1,146.

Messrs. R. G. Christie & Son's Black Orpington.

One of the group which laid greatest number of eggs (2,244) in two years, in Section E—Heavy Breeds.

Sixteenth Annual Competition.

SECTION A.—LIGHT BREEDS.

Greatest number of eggs laid during twelve months (groups of six birds).—(1) Mrs. M. Chalmers, White Leghorn, 1,525 eggs, £2; (2) W. H. Cole, White Leghorn, 1,491 eggs, £1 10s.; (3) Pert and Dunn, Chinese Langshan, 1,478 eggs, £1; (4) C. Leach, White Leghorn, 1,463 eggs, 10s.

Greatest number of eggs laid during twelve months (individual hens).—(1) A. E. Brown, Chinese Langshan (bird No. 226), 288 eggs, £2 10s. ; (2) A. Windeyer, White Leghorn (bird No. 147), 287 eggs, £2 ; (3) Pert and Dunn, Chinese Langshan (bird No. 234), 281 eggs, £1 10s. ; (4) S. McIllwraith, White Leghorn (bird No. 28), 276 eggs, £1 ; (5) Mrs. E. Hunt, White Leghorn (bird No. 91), 275 eggs, 10s.

Highest averages for twelve months (groups of six or five birds).—(1) Mrs. M. Chalmers, White Leghorn (six birds), average per hen, 254 eggs, £2 10s. ; (2) W. H. Cole, White Leghorn (six birds), average per hen, 248 eggs, £2 ; (3) Pert and Dunn, Chinese Langshan (six birds), average per hen, 246 eggs, £1 10s. ; (4) C. Leach, White Leghorn (six birds), average per hen, 243 eggs, £1.

Quarterly prizes (groups of six birds) :—

1st April to 30th June, 1917.—(1) Mrs. M. Chalmers, White Leghorn, 350 eggs, £1 10s. ; (2) Pert and Dunn, Chinese Langshan, 322 eggs, £1.

1st July to 30th September, 1917.—(1) A. E. Brown, Chinese Langshan, 432 eggs, £1; (2) Pert and Dunn, Chinese Langshan, 430 eggs, 10s.

1st October to 31st December, 1917.—

A. Duffield, White Leghorn, 433 eggs, and
W. H. Appleyard, White Leghorn, 433 eggs } Equal. Divide £1 10s.

1st January to 31st March, 1918.—(1) C. Leach, White Leghorn, 395 eggs, £1 10s. ; (2) W. H. Cole, White Leghorn, 383 eggs, £1.

Quality Prizes :—Ten groups of six pens, conforming most closely to standard type, were selected and allowed to compete for these prizes, which were finally allotted according to the number of eggs laid. No prize to be allotted to any group laying less than 1,080 eggs in twelve months.

(1) Mrs. Chalmers, White Leghorn (birds Nos. 163-168), 1,525 eggs, £1 10s.

(2) W. H. Cole, White Leghorn (birds Nos. 49-54), 1,491 eggs, £1.

SECTION B.—HEAVY BREEDS.

Greatest number of eggs during twelve months (groups of six birds).—(1) C. Judson, Black Orpington, 1,613 eggs, £2 ; (2) G. Hopping, Black Orpington, 1,422 eggs, £1 10s. ; (3) P. C. McDonnell, Black Orpington, 1,375 eggs, £1 ; (4) E. F. Silcock, Silver Wyandotte, 1,370 eggs, 10s.

Greatest number of eggs during twelve months (individual hens).—(1) C. Judson, Black Orpington (bird No. 322), 312 eggs, £2 10s. ; (2) C. Judson, Black Orpington (bird No. 323), 305 eggs, £2 ; (3) J. Turner, Silver Wyandotte (bird No. 281), 292 eggs, £1 10s. ; (4) C. Judson, Black Orpington (bird No. 324), 291 eggs, £1 ; (5) A. R. Miles, Black Orpington (bird No. 316), 273 eggs, 10s.

Highest averages for twelve months (groups of six or five birds).—(1) C. Judson, Black Orpington (six birds), average per hen, 268 eggs, £2 10s. ; (2) G. Hopping, Black Orpington (six birds), average per hen, 237 eggs, £2 ; (3) P. C. McDonnell, Black Orpington (six birds), average per hen, 229 eggs, £1 10s. ; (4) E. F. Silcock, Silver Wyandotte (six birds), average per hen, 228 eggs, £1.

Quarterly Prizes (groups of six birds) :—

1st April to 30th June, 1917.—(1) J. T. Brett, Black Orpington, 368 eggs, £1 10s. ; (2) J. England, Buff Orpington, 352 eggs, £1.

1st July to 30th September, 1917.—(1) C. Judson, Black Orpington, 483 eggs, £1 ; (2) G. Hopping, Black Orpington, 420 eggs, 10s.

1st October to 31st December, 1917.—(1) C. Judson, Black Orpington, 431 eggs, £1 ; (2) E. F. Silcock, Silver Wyandotte, 393 eggs, 10s.

1st January to 31st March, 1918.—(1) E. F. Silcock, Silver Wyandotte, 358 eggs, £1 10s. ; (2) C. Judson, Black Orpington, 348 eggs, £1.

Quality Prizes :—Ten groups of six pens, conforming most closely to standard type, were selected and allowed to compete for these prizes, which were finally allotted according to the number of eggs laid. No prize to be allotted to any group laying less than 1,080 eggs in twelve months.

(1) C. Judson, Black Orpington (birds Nos. 319-324), 1,613 eggs, £1 10s.

(2) T. Pritchard, Black Orpington (birds Nos. 355-360), 1,280 eggs, £1.

THE MONTHLY LAYING.

Month.	Second-year Test.		First-year Test.			
			Section A.		Section B.	
	Total for 120 hens.	Average per hen.	Total for 240 hens.	Average per hen.	Total for 180 hens.	Average per hen.
April, 1917	608	5·0	2,500	10·5	1,756	9·8
May, ,,	416	3·4	3,349	13·9	2,530	14·0
June, ,,	770	6·4	3,840	16·0	2,984	16·5
July, ,,	1,396	11·6	4,246	17·7	3,350	18·6
August, ,,	2,087	17·3	5,088	21·2	4,073	22·6
September, ,,	2,200	18·3	5,090	21·2	3,819	21·2
October, ,,	2,139	17·8	5,104	21·2	3,608	20·0
November, ,,	2,016	16·8	4,807	20·0	3,242	18·0
December, ,,	1,971	16·4	4,912	20·5	3,073	17·0
January, 1918	1,686	14·0	4,257	17·7	2,568	14·2
February, ,,	1,358	11·3	3,480	14·5	2,739	15·2
March, ,,	1,109	9·2	3,572	14·9	2,623	14·6
Totals	17,756	147·9	50,245	209·3	36,365	202·0

REVIEW OF THE RESULTS BY THE POULTRY EXPERT.

This competition has concluded without producing any sensational records, as records go to-day, but it is a matter for very great satisfaction that the splendid general averages of first-year hens attained in the last test have been maintained in this, and individual hens have made equally high scores. However, after all, the general average should be the main consideration, because upon it alone depends the advancement in egg production. We can better appreciate what this high general average means if we review the figures of the whole period of these tests. Previous to the 1915–16 competition the highest general average for first-year hens was made in the tenth competition, viz., 184 eggs per hen, and it was followed in the three subsequent years by 178, 177, and 181. These figures were prior to the operation of the minimum weight regulation. When the latter came into operation the average rose in the first year to 192, followed by 205·8 last year, and this year by 206·2. The significance of these figures must be patent to everyone who studies the subject, yet we have a few breeders still entertaining some prejudice against the weight regulation. The importance of this phase of the competitions cannot be too greatly emphasised; breeders will do well to accept as amply demonstrated the fact that, taken as a whole, good physique is necessary to the maintenance of high egg-laying capacity, and to get rid of the notion that small birds are necessarily the better layers.

Let me here again emphasise another point; it often happens that when birds are being forwarded for inclusion in the competition pens a plea is put in for some light-weight specimens, that they be accepted on the ground that they have been bred from tested high producers. I wish to emphasise the fact that no matter what they are bred from, if the physique is not there they are not fit subjects for a competition, simply because they are not fit subjects for the breeding pen; that being the case, it would be a waste of time to test them, and a delusion both to the breeder and the public. The regulation is imposed for the very purpose of excluding such weedy specimens. Many of those offering do not exceed 3 lb. weight in light breeds and 4 lb. in the heavy ones.

Looking back over the performances in this test, it will be remembered that during the early months the monthly averages fell somewhat behind those of the previous test. It is, however, satisfactory to find that, contrary to general expectations, a recovery has been made, though the light breed section was still left behind that of the previous year; the heavy breed section, however, put up such splendid performances that the general average was rescued from falling behind.

Remarks on the Two Sections.

In regard to the two sections, light and heavy, it was a notable feature in the light breeds that there were many poor specimens competing, so much so that when selecting the ten pens to compete for the quality prize it was a matter of some difficulty to choose ten with anything like evenness, and there is little doubt that had many of these poor specimens been eliminated—which could have been done at the commencement of the competition if strict culling were practicable—the average of this section would have been a great deal higher. On the other hand, in the heavy breed section, taken as a whole, there was a big improvement over previous years both in type and physique, and this is reflected in the higher averages attained. The outstanding feature is that the winning groups and many of the individual high producers are birds showing the best type and physique.

As bearing upon this subject, the weights of the two leading groups (first year hens) at the commencement of the competition and at the conclusion will be of interest:—

C. Judson:—Black Orpingtons.

Pen No.	Weight of Bird.	
	Commencement of Competition.	End of Competition.
	lb. oz.	lb. oz.
319	5 6	6 12
320	5 6	6 8
321	6 4	8 10
322	6 0	7 2
323	5 6	6 14
324	5 9	6 6

Hen No. 322 is the hen that has put up the score of 312 eggs. She had increased her weight during the competition from 6 lb. to 7 lb. 2 oz.

MRS. CHALMERS :—White Leghorns.

Pen No.	Weight of Bird.	
	Commencement of Competition.	End of Competition.
	lb. oz.	lb. oz.
163	3 14	4 8
164	3 14	4 10
165	4 4	5 2
166	4 0	4 10
167	4 2	4 12
168	4 3	5 4

These were all fairly typical, rather deep-bodied hens, perhaps a little bit on the "racy" side.

Ration Fed during the Test.

The rations fed throughout the test were:--

For the Morning Mash.		Evening Ration of Grain.
Pollard	60 per cent.	Two-thirds wheat.
Bran	20 ,,	One-third crushed maize.
Lucerne dust ...	12 ,,	
Meat or blood meal ...	8 ,,	
	100 per cent.	

Combined Nutritive Ratio, 1 to 4·5.

With the morning mash 22 oz. of common salt was used, and to ensure its even distribution through the mash, the salt was dissolved in the water with which the mash was mixed.

Greenstuff is supplied at mid-day.

Although the above is the ration that is laid down to be fed, and that has been fed as far as practicable during the test (as also in previous years), it should not be supposed that the feeding of the competition birds has been entirely free from the difficulties experienced to a greater or less extent by poultry farmers in general in regard to pollard, bran, and even wheat of good quality. During the first six months of the competition in particular, a shortage of one or the other, as well as poor quality, was frequently experienced, owing to the inability of the Department to secure adequate supplies.

The College staff are entitled to the appreciation of competitors for the way in which the general averages of last year have been maintained in the face of difficulties.

It might be well to point out a few facts in connection with the conduct of these competitions. The first is that the hens are fed on simple food, as shown above, such as is available to almost every poultry keeper; no patent foods, condiments, or other stimulating articles are used, nor are any methods to that end practised. Secondly, every hen receives exactly the same treatment, and there is no special pampering of individual hens or groups that may show promise of making big records. Thirdly, each hen must lay eggs not less than 2 oz. in weight in order to compete for a prize. It therefore follows that every hen making a record at this competition must have conformed to every essential imposed by straight out utility qualifications.

COMPARISON OF RESULTS.

The following tables analyse and compare the results of the whole series:—

SECOND-YEAR HENS.

No. of Competition.	No. of Pens.	Highest total, two years.	Highest total, second year.	Average per hen, first year.	Average per hen, second year.	Balance over feed per hen, first year.	Balance over feed per hen, second year.	Greatest value of eggs per hen, two years.
						s. d.	s. d.	£ s. d.
1st ..	40	2,487	1,054	180	124	11 2	6 0½	12 1 6
2nd ...	50	2,634	1,150	179	127	10 11	5 4¾	12 16 9
3rd ...	40	2,319	1,013	190	140	11 4	9 8	13 2 5
4th ...	40	2,369	1,045	194	134	16 9	5 8	12 14 2
5th ...	30	2,372	1,110	184	140	10 2	8 3	12 2 2
6th ...	30	2,373	1,028	201	135	14 4	6 11	12 11 7
7th ...	30	2,552	1,091	194	145	14 0	7 6	13 12 3
8th ...	28	2,421	1,156	190	158	13 7	9 2	12 1 8
9th ...	29	2,572	1,213	201	161	13 1½	11 6	14 5 2
10th ...	20	2,647	1,231	213	165	17 1	11 3	15 0 11¾
11th { D ...	10	2,672	1,146	241	164	20 2½	9 1¼	14 4 2½
11th { E ...	10	2,244	929	210	131	17 0¾	6 3	12 8 10¼

	Eggs per Hen.		Value per Hen.	
	First Year.	Second Year.	First Year.	Second Year.
Section D.			£ s. d.	£ s. d.
60 White Leghorns	241·3	164·8	1 7 0½	0 15 7¼
Section E.				
36 Black Orpingtons... ...	209·8	132·9	1 3 9¼	0 12 5¾
12 Silver Wyandottes ...	215·0	133·5	1 4 4½	0 13 10¼
12 Plymouth Rocks	208·8	123·0	1 3 8¾	0 12 5¾

ANNUAL COMPETITION.

	No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Greatest Value.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st ...	38	1,113	459	137	130	140/-	1/1	15/6	6/-	9/6
2nd ...	70	1,308	666	160	163	150/-	1/3¾	17/9	5/9¾	12/-
3rd ..	100	1,224	532	154	152	114/-	1/-	12/9	4/5½	8/3
4th ...	100	1,411	635	168	166	125/-	-/11½	13/3	5/3½	8/-
5th ...	100	1,481	721	162	171	137/-	1/0½	14/10	5/10	9/-
6th ...	60	1,474	665	161	173	149/-	1/2¼	17/2	7/-	10/2
7th ...	50	1,379	656	159	180	146/-	1/3¼	19/2	7/9½	11/4
8th ...	60	1,394	739	158	181	173/-	1/5¼	21/9	6/9	15/-
9th ...	40	1,321	658	151	168	134/5	1/2	16/3½	6/5½	10/2
10th ...	50	1,389	687	146	184	141/9	1/2½	18/5½	6/1½	12/4
11th ...	50	1,461	603	156	178	164/7	1/3½	19/4¼	7/3½	12/0¾
12th ...	50	1,360	724	152	177	145/3	1/2½	17/7	5/9	11/10
13th ...	63	1,541	705	162	181	152/9	1/2	17/8½	6/9½	10/11
14th ..	70	1,449	506	165	192	172/7	1/4½	22/2	7/7	14/7
15th { A	40	1,526	924	162	216	171/11	1/3¾	23/8¾	6/10	16/10¾
15th { B	30	1,479	749	165	192	171/3	1/3¾	21/7½	6/10	14/9½
16th { A	40	1,525	923	157	209	166/2¼	1/4	21/9¾	7/8	14/1¾
16th { B	30	1,613	931	170	202	172/3¼	1/4	21/2	7/8	13/6

ANNUAL COMPETITION—*continued.*

	Eggs per Hen.	Value per Hen. £	s.	d.
Section A.				
216 White Leghorns	208	1	1	7¾
24 Chinese Langshans	218	1	3	5
Section B.				
108 Black Orpingtons	206	1	1	11¼
30 Rhode Island Reds... ...	180	0	17	7½
24 Silver Wyandottes	210	1	2	0¼
6 Plymouth Rocks	180	0	19	0½
6 Buff Orpingtons	198	1	2	1¼
6 Croad Langshans	213	1	2	10

Monthly Scores of Leading Birds.

The following are the individual monthly scores of the leading ten hens in Sections A and B, and of the leading five hens in Sections D and E:—

Owner and Breed.	Hen No.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	February.	March.	Total.
FIRST YEAR.														
Section A—Light Breeds.														
A. E. Brown : Chinese Langshan ...	226	25	26	25	23	27	25	22	25	26	17	21	26	288
A. E. Windeyer : White Leghorn ...	147	20	22	24	25	25	24	25	25	25	25	23	24	287
Pert & Dunn : Chinese Langshan ...	234	17	23	24	25	25	25	24	23	26	22	24	23	281
W. Maskell: White Leghorn	184	20	18	14	21	24	25	27	28	30	26	21	24	278
S. McIllwraith : White Leghorn ...	28	19	20	22	23	26	25	26	23	25	21	23	23	276
Mrs. E. J. Hunt : White Leghorn ...	91	8	23	22	21	24	26	26	23	27	25	24	26	275
F. C. Harders : White Leghorn ...	127	15	23	24	22	24	24	26	28	28	23	16	21	274
Mrs. W. V. Hopkins : White Leghorn	173	14	21	21	20	22	25	25	26	27	24	23	22	270
G. White : White Leghorn	11	13	21	21	21	22	25	24	25	27	23	21	25	268
W. H. Appleyard : White Leghorn ...	193	20	15	18	18	21	26	29	27	31	27	20	16	268
Section B—Heavy Breeds.														
C. Judson : Black Orpington... ...	322	25	26	26	28	27	27	29	27	24	18	28	27	312
C. Judson : Black Orpington... ...	323	17	25	24	27	27	30	28	24	27	26	23	27	305
J. Turner : Silver Wyandotte... ...	281	23	26	23	21	25	28	30	16	28	18	26	28	292
C. Judson : Black Orpington... ...	324	23	23	23	23	29	29	26	24	27	11	26	27	291
A. R. Miles : Black Orpington ...	316	26	21	24	28	27	26	26	21	28	19	19	8	273
A. Hughes : Black Orpington... ...	362	23	21	23	24	28	22	27	16	26	12	25	24	271
G. Hopping : Black Orpington ...	382	21	25	21	25	26	28	28	26	19	14	25	12	270
C. Judson : Black Orpington... ...	319	14	23	27	29	29	22	26	22	23	20	14	17	266
R. W. Ray : Silver Wyandotte ...	267	21	20	22	22	25	27	25	22	25	20	12	23	264
J. T. Brett : Black Orpington ...	347	22	22	20	15	20	23	23	20	25	24	23	22	259
SECOND YEAR.														
Section D—Light Breeds.														
W. F. Elliott : White Leghorn ...	422	23	16	3	20	22	24	24	25	30	25	21	24	257
J. M. Weaver : White Leghorn ...	432	14	11	10	22	20	23	24	24	21	26	22	9	225
Mrs. H. Snowden : White Leghorn ...	452	2	2	17	21	24	24	25	21	24	22	22	20	224
Mrs. H. Snowden : White Leghorn ...	453	14	...	12	19	22	22	22	23	25	21	20	23	223
J. M. Weaver : White Leghorn ...	431	8	...	12	23	23	24	23	21	23	22	21	21	221
Section E—Heavy Breeds.														
R. Whitelaw : Plymouth Rock ...	522	14	9	8	21	21	25	25	23	11	21	21	20	219
E. J. Kinney : Silver Wyandotte ...	531	20	20	17	16	13	16	22	18	15	11	18	19	205
R. G. Christie & Son : Black Orpington	485	9	...	16	23	11	25	23	17	19	22	11	24	200
R. Whitelaw : Plymouth Rock ...	520	6	...	11	18	20	21	23	20	20	13	24	23	199
W. H. Forsyth : Silver Wyandotte ...	535	7	2	18	15	12	22	25	22	24	12	16	21	196

The Detailed Returns.

The following tables give full details of the number of eggs laid by the individuals in each group of six birds, together with the market value and weight of the eggs. The figures in parenthesis after each competitor's name indicate the deaths and replacements during the year.

SECOND-YEAR HENS. Section D—Light Breeds.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Individual Totals.	Group Totals.	Total, 2 years.	Weight per doz.	Value Second Year.	Total Value.
																	oz.	£ s. d.	£ s. d.
1. J. M. Weaver (0), Castle Hill : White Leghorn ..	252	3	0	3	18	20	21	23	23	20	12	14	20	177					
	235	4	15	12	19	22	22	20	19	21	16	0	16	186					
	266	0	9	16	14	21	20	21	21	18	16	13	0	169					
	229	0	0	0	12	19	21	21	24	23	21	9	18	168					
	297	8	0	12	23	23	24	23	21	23	22	21	21	221					
	247	14	11	10	22	20	23	24	24	21	25	22	9	225	1146	2672	26·2	5 12 2¾	14 4 2¼
2. S. H. K. Champion (0), Toongabbie : White Leghorn	231	0	0	15	15	22	24	23	20	23	22	15	16	195					
	211	0	0	7	19	23	21	24	27	23	23	8	0	175					
	276	3	0	8	18	20	24	25	22	24	21	19	24	208					
	286	0	0	6	13	21	22	25	22	24	24	22	10	189					
	234	0	0	0	14	21	23	20	19	13	17	10	14	151					
	256	2	0	0	16	21	21	22	21	22	20	14	18	177	1095	2589	25·0	5 0 5¼	13 5 5¾
3. W. F. Elliott (1), Werrington : White Leghorn ..	208	0	0	0	19	21	20	22	20	25	14	0	10	151					
	255	23	16	3	20	22	24	21	25	30	25	21	24	257					
	248	4	0	7	16	23	20	23	23	22	20	19	19	196					
	254	1	0	11	11	20	21	21	22	22	21	15	16	181					
	267	9	2	19	17	19	21	20	21	13	19	18	18	196					
	261	3	19	12	16	19	19	13	2	0	0	0	0	103*	1084	2577	29·0	5 7 0¾	13 16 3½
4. E. Kennedy (0), Nowra : White Leghorn	207	0	0	0	11	22	20	21	21	20	15	10	0	140					
	289	6	8	18	19	22	22	22	21	24	17	16	19	214					
	160	0	0	0	7	20	21	13	21	22	9	8	0	121					
	254	1	17	11	12	20	24	22	24	23	20	17	0	191					
	253	8	0	14	21	24	21	20	20	22	20	19	21	210					
	276	2	0	14	20	22	19	21	21	23	22	18	21	203	1079	2518	29·5	5 2 2½	13 3 11¼
5. J. R. Stewart (0), Tahmoor : White Leghorn .	254	6	0	2	19	22	22	24	24	23	22	20	18	202					
	232	2	0	3	21	19	22	23	23	21	21	16	18	189					
	232	4	0	2	15	13	20	20	19	7	16	0	0	116					
	248	2	0	4	20	21	25	23	22	23	20	20	15	195					
	214	0	0	14	12	23	22	21	25	23	10	0	0	150					
	259	3	0	18	19	22	22	21	12	20	20	9	4	170	1022	2461	26·7	4 13 6¼	12 10 2¼
6. Mrs. H. Snowden (1), Tumut : White Leghorn ..	205	0	0	0	3	0	0	0	0	0	0	0	0	3*					
	286	2	2	17	21	24	24	25	21	24	22	22	20	224					
	288	14	0	12	19	22	22	22	23	25	21	20	23	223					
	182	0	0	0	0	17	22	25	23	24	22	17	11	161					
	260	4	0	5	20	24	25	16	1	13	24	19	14	165					
	229	0	2	21	21	21	22	24	25	23	20	19	21	219	995	2445	24·5	4 15 11¾	12 17 3¾
7. Hillcrest P. Farm (2), Berowra : White Leghorn ..	264	4	0	13	19	24	23	24	25	26	24	22	15	219					
	262	9	0	0	5	20	20	19	20	25	21	18	19	176					
	213	9	4	5	17	17	17	20	16	16	19	12	13	165					
	278	21	22	19	19	20	20	21	11	0	0	0	0	153*					
	208	1	0	0	0	0	0	0	0	0	0	0	0	1*					
	257	2	8	7	14	19	21	21	23	22	21	18	20	196	910	2392	27·5	4 11 0¼	12 17 10¼

* Bird died; not replaced.

SECTION D—Light Breeds—*continued.*

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Individual Totals.	Group Totals.	Total, 2 years.	Weight per doz.	Value Second Year.	Total Value.
																	oz.	£ s. d.	£ s. d.
8. Mrs. Bradburne (0), Kogarah : White Leghorn ..	278	8	0	0	18	19	16	23	25	25	24	24	22	204					
	209	0	0	0	18	20	22	21	16	20	18	15	13	163					
	168	0	0	0	10	21	23	23	22	24	20	6	0	149					
	192	0	0	0	13	20	20	12	12	23	18	7	0	125					
	267	2	0	16	21	22	25	23	21	22	21	19	22	214					
	254	3	0	0	1	21	20	22	19	23	22	6	0	137	992	2360	26·7	4 8 10¾	12 1 2¼
9. H. C. Bailey (0), Thirlmere : White Leghorn ..	255	6	0	13	19	20	20	18	19	22	20	13	20	190					
	243	0	4	19	4	15	17	18	18	19	17	12	2	145					
	183	0	0	5	16	20	22	22	18	12	15	0	13	143					
	203	1	0	5	10	17	21	24	23	24	21	0	8	154					
	262	2	0	0	14	20	21	22	19	20	18	6	0	142					
	182	0	2	17	16	19	19	16	11	17	0	5	0	122	896	2224	27·2	4 1 5½	11 14 0¾
10. B. Clarke (1), Old Guildford : White Leghorn ..	245	3	0	12	16	21	20	21	19	24	17	17	6	176					
	252	3	0	2	17	20	20	21	22	19	15	18	14	171					
	267	11	9	4	21	23	22	21	19	22	0	9	5	166					
	260	1	0	6	8	17	17	18	16	23	21	17	14	158					
	233	2	0	0	0	0	0	0	0	0	0	0	0	2*					
	207	0	0	0	0	0	0	0	0	0	0	0	0	0	673	2137	27·6	3 3 8	11 8 6½

SECTION E—Heavy Breeds.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Individual Totals.	Group Totals.	Total, 2 years.	Weight per doz.	Value Second Year.	Total Value.
1. R. G. Christie & Son (1), Eastwood : Black Orpington	248	17	1	2	0	0	0	0	1	0	0	1	0	22*					
	234	0	0	0	2	21	22	13	21	22	12	17	21	151					
	221	18	20	2	9	24	15	23	20	15	10	24	5	185					
	164	0	3	14	14	23	16	23	15	20	11	16	9	167					
	272	9	0	16	23	11	25	23	17	19	22	11	24	209					
	217	3	0	16	19	23	18	13	16	15	17	13	10	163	888	2244	24·5	4 9 0½	12 8 10¼
2. T. J. Earl (0), Sefton Park : Black Orpington ..	188	5	0	10	1	15	20	10	17	13	10	12	11	124					
	200	12	0	0	11	23	22	24	17	12	22	9	0	152					
	227	11	14	12	2	18	21	19	19	21	9	19	1	166					
	297	0	0	4	6	19	22	21	22	28	19	18	17	176					
	230	8	0	0	4	20	11	14	17	15	18	9	14	130					
	200	11	0	14	5	14	14	8	14	14	11	9	0	114	862	2204	24·0	4 2 5	11 17 4¼
3. R. Whitelaw (0), Blacktown : Plymouth Rock ..	210	0	0	0	0	16	24	16	20	18	11	0	0	105					
	193	0	0	0	0	14	23	13	23	13	9	14	0	109					
	219	8	13	2	5	24	21	25	19	17	15	9	13	171					
	225	6	0	11	18	20	21	23	20	20	13	24	23	199					
	190	2	0	0	0	5	19	9	19	14	4	18	21	111					
	246	14	9	8	21	21	25	25	23	11	21	21	20	219	914	2197	26·0	4 7 1¾	11 12 9¾

* Bird died ; not replaced.

SECTION E—Heavy Breeds—*continued.*

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Individual Totals.	Group Totals.	Total, 2 years.	Weight per doz.	Value Second Year.	Total Value.
																	oz.	£ s. d.	£ s. d.
4. E. J. Kinney (0), Beecroft : Silver Wyandotte ..	148	0	0	11	8	11	22	20	21	20	18	8	0	139					
	223	12	11	4	14	17	18	14	12	19	12	17	9	159					
	225	20	20	17	16	13	16	22	18	15	11	18	19	205					
	169	1	0	2	1	5	20	20	19	19	15	4	0	106					
	243	8	9	0	2	21	20	13	17	12	16	11	15	144					
	247	12	16	13	14	14	20	22	18	18	20	5	4	176	929	2184	26·0	4 13 4¾	11 12 9
5. R. Hardcastle (0), Kogarah : Black Orpington ..	210	0	0	3	19	17	21	24	20	23	18	19	14	178					
	238	5	0	0	19	22	24	22	14	14	11	22	24	177					
	167	0	0	0	0	21	17	18	18	13	5	16	13	121					
	269	9	0	3	17	20	21	20	21	19	20	17	20	187					
	221	14	21	20	23	17	0	3	0	0	0	4	0	102					
	173	1	0	0	1	19	9	12	11	16	11	11	8	99	864	2142	27·5	4 5 0	11 12 8
6. W. H. Forsyth (2), Willoughby : Silver Wyandotte	111	7	2	18	15	12	22	25	22	24	12	16	21	196					
	211	7	0	0	9	21	18	12	16	11	0	0	0	94					
	231	16	11	0	14	21	24	20	19	20	5	0	0	150					
	256	20	20	15	0	0	0	0	0	9	20	20	20	124					
	258	15	3	8	17	17	4	0	0	0	0	0	0	64*					
	259	14	3	3	19	7	0	0	0	0	0	0	0	46*	674	2000	27·2	3 12 11¼	11 6 3¾
7. C. E. Warren (0), Punchbowl : Black Orpington ..	175	3	0	0	12	14	17	19	18	11	17	9	7	127					
	217	0	0	1	22	25	23	20	20	13	10	19	0	153					
	203	0	0	2	25	15	17	20	12	13	18	18	8	148					
	251	5	0	0	0	20	25	24	21	24	0	12	0	131					
	143	1	0	11	9	19	3	9	0	0	0	0	1	53					
	225	3	0	13	12	20	21	21	19	11	14	13	8	155	767	1981	28·5	3 8 10¼	10 4 0¼
8. D. Little (0), North Ryde : Black Orpington ..	171	0	0	0	0	20	21	13	13	19	4	0	0	90					
	163	0	0	0	0	6	19	18	18	7	16	2	0	86					
	238	2	0	15	9	19	20	22	21	10	19	14	2	153					
	224	0	17	7	12	16	19	23	23	23	24	5	6	175					
	172	0	0	0	0	16	23	22	18	19	8	6	2	114					
	237	15	14	2	14	16	16	21	10	14	15	3	2	142	760	1965	28 5	3 8 4	9 18 10
9. King & Watson (0), St. Mary's : Black Orpington ..	179	0	0	0	0	20	18	14	20	10	12	16	6	116					
	264	6	0	9	1	12	18	22	21	10	4	16	0	119					
	161	1	0	0	0	9	17	19	15	23	8	19	16	127					
	172	0	0	0	0	0	14	14	11	15	10	4	0	68					
	207	3	0	0	0	23	16	17	9	17	15	0	0	100					
	178	1	0	0	0	7	18	13	21	20	15	19	0	114	644	1805	26·0	2 16 0¼	9 4 1¾
10. E. F. Thomson (0) Dundas : Plymouth Rock ..	177	16	0	0	23	15	15	19	16	17	13	3	15	152					
	184	8	21	19	12	19	19	3	9	0	0	0	0	110					
	249	1	0	14	9	9	0	0	0	0	0	4	0	37					
	201	13	20	3	0	10	22	23	19	1	22	10	16	159					
	202	14	7	7	9	11	4	7	0	0	0	0	0	59					
	210	15	11	0	1	10	8	0	0	0	0	0	0	45	562	1785	28·2	3 2 8¾	10 1 10¼

* Bird died ; not replaced.

Sixteenth Annual Competition.

Section A (Light Breeds).

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen.
															oz.
1. Mrs. M. Chalmers (0), Kogarah: White Leghorn. Market Value, £8 6s. 2¼d.	21	18	22	21	24	24	23	23	23	24	20	23	266		26·8
	17	18	18	19	23	24	24	24	23	23	20	21	254		26·2
	20	19	20	20	22	23	21	21	20	10	24	20	240		25·4
	20	21	20	17	20	23	22	24	24	21	20	20	252		28·1
	19	19	20	17	22	24	24	23	24	23	22	22	259		26·4
	19	21	18	19	21	23	21	25	22	19	22	24	254	1525	25·5
2. W. H. Cole (0), Heathcote: White Leghorn. Market Value, £7 19s. 8¼d.	14	14	17	19	24	25	25	12	22	22	23	23	240		25
	21	20	9	20	21	23	24	23	25	21	20	22	249		24·3
	15	14	11	23	24	25	20	24	24	22	18	20	240		25
	19	11	20	21	22	24	25	18	26	22	21	24	253		24·2
	18	18	19	19	22	23	24	25	25	23	18	24	258		25
	18	18	20	22	24	22	22	22	23	20	18	22	251	1491	26·5
3. Pert & Dunn (0), Arncliffe: Chinese Langshan. Market Value, £7 17s. 7½d.	20	20	21	20	22	22	22	16	12	22	19	23	239		20·9
	0	27	18	14	28	26	19	25	21	18	25	24	245		24·7
	1	2	25	29	30	25	28	19	25	15	17	15	231		22·4
	11	27	25	28	28	25	22	25	29	23	13	3	259		25
	19	21	21	22	20	16	20	19	18	15	15	17	223		25·7
	17	23	24	25	25	25	24	23	26	22	24	23	281	1478	24·3
4. C. Leach (0), Revesby: White Leghorn. Market Value, £7 16s. 8½d.	12	12	21	21	24	23	22	16	19	21	22	23	236		24
	6	16	19	21	22	18	23	20	10	21	21	24	221		27·2
	10	18	20	21	25	23	22	23	22	21	25	23	253		25·6
	18	21	21	23	22	22	24	19	23	23	21	23	260		25·1
	8	15	21	19	23	24	26	27	25	24	24	24	260		24·2
	18	17	19	20	22	18	23	19	22	17	19	19	233	1463	24
5. Mrs. G. Reed (0), Sefton Park: White Leghorn. Market Value, £7 7s. 4½d.	5	15	21	23	23	25	25	26	27	22	9	5	226		24
	21	6	8	21	22	21	17	23	27	24	21	22	233		24
	0	23	19	21	23	23	22	22	25	17	2	15	212		24·3
	16	19	21	22	24	24	21	23	26	22	19	19	259		22·4
	10	25	21	22	23	23	21	22	19	22	19	19	246		24·9
	10	11	8	19	21	22	23	21	24	21	19	21	220	1396	24·1
6. A. E. Brown (0), Beecroft: Chinese Langshan. Market Value, £7 8s. 6½d.	12	23	22	23	26	23	19	17	15	14	7	14	215		26·5
	21	5	21	22	23	13	18	16	13	8	21	22	203		26
	1	29	21	22	27	28	24	19	16	23	18	6	234		25·5
	25	26	25	23	27	25	22	25	26	17	21	26	288		24·3
	9	12	16	26	27	23	24	17	15	21	17	15	222		24·3
	0	10	24	24	27	23	22	22	25	11	21	22	231	1393	27·5
7. A. Duffield (0), Carlingford: White Leghorn. Market Value. £6 19s. 10¾d	11	7	19	12	24	23	24	24	25	22	23	22	236		37·2
	21	0	20	24	24	28	26	26	26	21	20	21	257		24·1
	14	7	23	10	28	26	31	29	32	24	3	0	227		21·7
	9	23	23	23	22	19	21	15	5	20	1	16	197		24·1
	20	4	19	9	25	24	23	25	28	19	19	28	243		24
	2	3	22	14	25	22	24	22	27	23	18	16	218	1378	24
8. W. Maskell (0), Farley: White Leghorn. Market Value, £7 7s. 6d.	7	17	12	14	19	22	25	23	27	21	13	21	221		24·8
	20	16	13	18	21	25	25	27	28	25	21	25	264		24·5
	21	20	16	22	23	21	23	22	23	21	14	17	243		24·5
	20	18	14	21	24	25	27	28	30	26	21	24	278		22·4
	22	22	16	18	21	5	0	0	0	0	0	0	104		24
	0	14	23	21	23	22	27	26	28	27	27	25	263	1373	25·4
9. T Partridge (0), Westmead: White Leghorn. Market Value, £7 3s. 3¾d.	16	13	13	6	16	17	23	20	24	8	20	12	188		27
	11	9	7	17	21	22	23	22	19	21	20	20	212		25
	3	23	23	20	24	23	23	24	27	26	20	23	259		25
	5	23	22	21	23	24	23	25	28	25	21	25	265		25
	10	16	11	23	23	22	23	23	26	23	21	9	230		24·5
	12	12	12	11	19	23	20	22	23	21	19	24	218	1372	25·8
10. Bella Vista Poultry Farm (0), Mt. Druitt: White Leghorn. Market Value, £7 5s. 6¼d.	18	13	17	19	21	23	22	20	23	20	17	19	232		26·1
	15	17	21	21	23	24	24	22	24	21	22	23	257		25·4
	18	20	21	20	22	24	24	22	26	22	22	24	265		24
	15	14	15	18	19	18	22	20	21	17	12	14	205		25·2
	17	0	15	18	21	23	19	16	12	13	6	5	165		24·8
	10	20	20	20	22	22	23	21	25	22	18	23	246	1370	25·2
11. M. C. Byrne (0), Revesby: White Leghorn. Market Value, £7 3s. 11½d.	18	25	19	19	20	21	20	19	21	17	11	16	226		24
	16	20	17	13	22	21	22	24	24	21	18	18	236		24
	13	21	20	17	19	22	22	24	22	20	17	22	239		24
	0	2	23	22	24	25	26	25	27	25	22	25	246		24
	3	8	15	15	18	21	20	20	22	19	19	20	200		24
	15	17	16	14	15	19	20	18	23	19	18	20	214	1361	24
12. Mrs. E. Hunt (0), Berowra: White Leghorn. Market Value, £7 2s. 6¾d.	8	23	22	21	24	26	26	23	27	25	24	26	275		25·8
	16	15	16	15	18	18	20	20	22	18	18	17	213		25·6
	3	21	23	21	24	20	21	21	22	17	14	19	226		26·5
	1	11	20	20	23	25	23	19	24	21	13	20	220		24·8
	15	6	20	21	21	17	19	14	21	14	15	15	198		26·9
	12	17	8	19	21	20	23	22	24	21	19	18	224	1356	25

SIXTEENTH ANNUAL COMPETITION—*continued.*

Section A (Light Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March	Individual Totals.	Group Totals.	Weight per dozen. oz.
13. E. T. Rhodes (0), Ryde: White Leghorn. Market Value, £7 3s. 6d.	15	12	16	22	21	20	21	19	12	15	14	18	205		27
	13	19	17	18	18	19	20	19	20	20	12	12	207		24
	0	21	22	23	23	24	21	24	16	17	20	21	232		24
	18	20	19	19	20	22	23	20	19	19	20	18	237		27
	10	20	18	19	19	20	22	18	22	16	14	19	217		27
	14	17	17	22	14	22	23	23	24	22	19	21	238	1336	26·2
14. S. P. Simmons (0), Hurstville: White Leghorn. Market Value, £6 12s. 6¼d.	1	12	3	21	24	27	25	27	25	21	11	0	197		25
	0	17	8	5	16	20	22	20	23	20	10	0	161		25·8
	10	20	15	20	23	23	23	22	12	20	20	22	230		24
	7	23	13	23	24	26	26	23	23	22	10	3	223		24·2
	17	10	10	22	25	26	27	26	25	22	22	19	251		24·5
	22	16	17	11	25	25	27	22	26	21	15	20	247	1309	24·9
15. A. Greentree (1), Wilberforce: White Leghorn. Market Value, £6 14s. 8½d.	10	16	7	14	22	24	24	25	27	25	11	20	225		24
	1	0	4	20	25	22	24	24	23	16	19	22	200		24
	1	19	20	19	22	21	15	21	26	20	8	23	215		25·8
	15	12	20	22	26	24	25	23	26	23	23	26	265		24·7
	17	20	21	20	24	18	23	15	0	0	0	0	158†		25·8
	9	19	17	19	24	22	22	24	23	18	19	22	238	1301	24
16. B. Carnell (2), Punchbowl. White Leghorn. Market Value, £6 13s. 2d.	7	19	17	21	22	25	24	25	25	22	22	20	249		24·5
	2	18	9	20	21	20	21	23	22	19	9	19	203		24
	0	22	7	14	20	19	14	21	20	19	4	7	167		25·8
	17	21	19	18	24	23	24	22	20	12	7	0	207†		24·1
	0	2	20	24	23	25	26	26	27	21	9	23	226*		26
	12	18	21	21	23	23	22	23	24	21	18	21	247	1299	26·4
17. L. Graham (0), Rooty Hill: White Leghorn. Market Value, £6 15s. 3¼d.	13	14	21	20	22	20	21	21	22	18	21	22	235		27·1
	8	21	21	18	21	19	19	17	24	19	22	22	231		25·3
	7	18	13	11	22	24	22	23	20	20	14	22	216		24·1
	2	22	13	0	9	25	25	27	18	21	9	22	193		17·8
	2	10	20	18	20	21	21	23	21	3	2	0	161		25·6
	7	22	21	20	22	23	24	24	25	22	23	22	255	1291	25·8
18. A. Windeyer (1), Beecroft: White Leghorn. Market Value, £6 19s. 0¾d.	22	23	20	18	18	20	22	20	17	6	0	13	199		24·8
	13	22	21	19	0	0	0	0	0	0	0	0	75†		25·7
	20	22	24	25	25	24	25	25	25	25	23	24	287		24·5
	0	0	2	25	22	22	22	24	24	21	19	21	202		26·1
	21	23	23	24	22	22	24	20	22	19	18	15	253		24
	5	27	27	26	26	27	27	25	22	26	15	10	263	1279	22
19. L. Bulluss (0), Glenfield: White Leghorn. Market Value, £6 10s. 4¾d.	8	14	9	15	21	20	22	24	24	18	15	0	190		26·9
	16	17	19	20	23	17	22	24	26	24	20	18	246		24·1
	3	20	22	22	24	21	25	20	17	5	18	20	217		21·9
	13	20	16	18	22	24	24	22	23	14	11	22	229		24·5
	23	11	15	16	23	22	24	22	25	19	0	0	200		24·9
	13	4	19	21	22	22	22	21	18	19	1	0	182	1264	25·4
20. F. C. Harders (0), Ingleburn: White Leghorn. Market Value, £6 6s. 5¾d.	15	23	24	22	24	24	26	28	28	23	16	21	274		25
	8	12	7	7	21	22	25	22	23	22	20	12	201		25·2
	3	21	9	12	19	20	21	22	14	17	20	21	199		24
	4	0	0	6	23	24	25	24	25	22	19	6	178		25
	5	6	19	18	21	24	25	24	25	22	13	15	217		25·4
	20	12	16	11	23	18	23	15	27	21	2	0	188	1257	25·5
21. C. Banks (0), Central Bankstown: Chinese Langshan. Market Value, £6 10s. 7½d.	4	24	25	27	20	23	13	24	16	15	18	25	234		24·9
	0	0	17	25	23	18	26	22	18	10	27	13	199		24·8
	16	24	22	22	26	25	23	13	13	8	1	1	194		25·6
	0	1	18	19	24	17	21	22	16	13	14	18	183		28·4
	0	25	9	26	15	18	20	16	13	13	8	13	176		28·8
	13	25	14	29	22	29	19	18	24	19	18	29	259	1245	21·3
22. G. White (1), Willoughby: White Leghorn. Market Value, £6 16s. 0¼d.	4	20	21	20	23	22	22	21	22	24	13	20	232		27
	19	19	16	20	21	22	23	22	25	22	17	22	248		27
	22	23	22	23	14	0	0	0	0	0	0	0	104†		25·8
	6	15	10	13	18	20	16	16	5	13	8	1	141		27
	13	21	21	21	22	25	24	25	27	23	21	25	268		25
	18	21	19	20	23	22	23	23	22	21	19	19	250	1243	26·5
23. O'Hearn Bros. (0), West Maitland: White Leghorn. Market Value, £6 9s. 1½d.	12	21	18	14	20	22	23	15	15	20	17	16	213		29·6
	1	22	19	8	22	22	22	18	17	21	19	12	203		24·8
	17	20	19	20	22	22	24	23	21	21	20	17	246		25·2
	9	2	14	13	20	24	23	22	23	11	1	11	173		25·5
	18	10	13	21	22	22	24	25	24	21	16	12	228		24
	17	19	20	22	19	23	23	17	10	3	0	0	173	1236	24
24. G. A. Steele (0), Kogarah: White Leghorn. Market Value, £6 0s. 10d.	0	1	19	21	23	24	24	25	27	22	19	21	226		25·2
	0	6	18	24	23	22	22	21	23	17	16	20	212		24·8
	0	0	3	25	30	30	30	26	27	10	28	28	237		24
	17	15	4	11	18	20	14	21	21	5	1	0	147		24·5
	21	8	24	20	24	24	23	23	27	20	0	0	214		24·8
	0	1	18	21	21	22	19	21	22	19	17	19	200	1236	24·3

* Bird replaced; score struck out. † Bird died; not replaced.

SIXTEENTH ANNUAL COMPETITION—*continued.*

Section A (Light Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen. oz.
25. D. Murchison (0), Canley Vale : White Leghorn. Market Value, £6 5s. 10d.	19	18	11	16	23	22	24	25	24	24	23	18	247		27·8
	17	5	20	19	22	22	21	21	21	22	19	20	229		25·2
	20	23	18	22	23	20	21	18	17	11	0	0	193		27·5
	20	15	10	21	21	22	22	20	25	14	0	14	204		26·9
	2	16	19	19	21	22	24	20	24	20	13	0	200		27·4
	0	0	11	11	17	21	23	24	26	23	2	0	158	1231	26
26. P. C. Pratt (0), Helensburgh : White Leghorn. Market Value, £6 4s. 10½d.	16	21	21	18	18	13	1	0	0	0	0	0	108		24·8
	7	0	18	24	24	26	27	17	21	16	10	7	197		25·4
	1	14	22	16	21	21	23	23	21	22	16	7	207		24·2
	0	17	24	26	27	26	26	24	27	24	21	22	264		25·5
	3	14	21	19	22	22	23	22	23	18	19	17	223		24
	10	11	6	16	23	24	24	22	23	18	20	22	219	1218	25
27. W. H. Appleyard (0) Old Guildford : White Leghorn. Market Value, £5 17s. 3½d.	20	15	18	18	21	26	29	27	31	27	20	16	268		24·3
	6	0	0	24	25	26	25	25	28	22	18	14	213		24·8
	0	0	10	18	22	22	22	23	26	23	19	20	205		24·1
	1	0	3	21	20	23	19	22	21	6	21	18	175		26·9
	4	0	6	19	23	24	26	23	7	3	1	0	136		26
	20	19	11	11	25	25	25	27	27	23	6	0	219	1216	24·8
28. Mrs. F. Skinner (0), Central Bankstown : White Leghorn. Market Value, £6 3s. 7½d	18	21	18	20	20	23	22	21	23	21	19	19	245		24
	20	20	5	9	23	25	25	26	25	20	10	0	208		24·5
	17	10	4	20	19	21	23	20	25	20	16	10	205		24·3
	5	16	7	0	15	19	20	21	22	21	19	17	182		24·1
	3	14	21	24	24	25	28	25	28	23	20	23	258		24·5
	0	0	1	20	14	19	21	19	4	19	0	0	117	1215	25·5
29. W. Hirst (0), Blacktown : White Leghorn. Market Value, £5 12s. 8½d.	1	4	13	21	22	25	26	26	29	24	24	21	256		27·3
	5	16	13	18	21	21	24	20	22	20	18	15	213		28·4
	1	7	11	7	19	19	17	18	18	13	1	0	131		24
	0	0	0	9	23	23	24	24	25	24	20	2	174		24·9
	16	18	16	17	21	22	25	23	24	9	4	20	215		24·9
	3	0	0	14	22	24	25	24	28	25	17	18	200	1169	27·5
30. D. Kennedy (0), East Hills White Leghorn. Market Value, £5 14s. 4¼d	0	9	18	16	20	22	16	16	16	16	10	0	159		24
	1	0	19	21	22	21	25	22	23	23	17	12	206		24
	0	18	19	17	21	21	24	21	21	21	19	19	221		25
	4	15	11	1	22	22	22	21	20	21	2	0	161		22·8
	0	15	14	8	21	20	23	24	23	19	18	8	193		24·5
	0	13	20	22	24	23	23	21	21	19	15	22	223	1163	24·1
31. C. C. Kennett (1), Glenfield : White Leghorn. Market Value, £6 3s. 10d.	22	12	20	18	24	24	26	24	27	23	23	23	266		25·5
	18	9	18	19	23	21	21	21	22	20	17	8	217		24·2
	23	15	21	22	23	23	23	16	20	19	18	17	240		27·7
	18	18	13	21	11	0	2	2	1	0	0	0	86		22·5
	9	9	14	9	18	21	22	23	23	21	20	20	209		26·7
	15	12	16	9	18	17	20	12	13	0	0	0	132†	1150	24·3
32. G. Speed (1), Mt. Druitt : White Leghorn. Market Value, £5 18s. 9¾d.	11	18	7	14	23	23	24	25	27	23	21	23	239		27·9
	9	10	6	11	22	21	16	10	8	0	6	0	119†		25·6
	12	16	11	16	18	20	17	12	18	20	20	17	197		25·4
	9	16	17	20	22	23	20	14	8	16	16	9	190		27·9
	10	19	6	15	20	19	20	21	19	18	3	0	170		27·1
	6	18	20	21	22	23	22	22	25	22	17	11	229	1144	24·5
33. F. J. Morison (0), Nowra Chinese Langshan. Market Value, £6 5s. 2½d	16	17	15	27	13	23	21	12	15	27	12	10	208		24·8
	23	13	10	19	17	16	17	12	17	15	11	13	183		24·3
	26	18	22	12	20	18	25	18	16	15	18	20	228		20·9
	6	23	23	18	18	18	21	11	14	21	16	12	201		24
	16	6	20	10	24	12	12	3	0	1	2	11	117		24
	18	10	26	9	24	20	17	5	18	16	20	12	195	1132	24
34. J. S. Crittle (1), Eastwood : White Leghorn. Market Value, £5 16s. 9d.	17	4	10	10	16	20	22	20	17	0	0	16	152		27·1
	13	20	21	18	23	0	0	0	0	0	0	0	95†		25·6
	5	11	11	20	23	26	25	23	24	21	15	10	214		24·4
	0	22	19	21	23	23	21	20	23	21	21	15	229		24
	3	9	20	22	22	24	24	24	26	24	15	23	236		27·1
	7	20	19	19	21	20	15	19	21	19	11	5	196	1122	25·2
35. D. Dryburgh (1), Punchbowl : White Leghorn. Market Value, £5 13s. 8¼d.	5	11	20	17	21	21	24	21	15	20	16	11	202		27·9
	14	7	0	1	5	14	19	23	28	24	23	16	174		27·1
	4	4	6	9	16	19	20	18	14	13	9	3	135		26
	5	14	21	21	23	23	23	22	22	12	18	24	228*		25·8
	11	21	21	18	21	22	22	19	12	9	6	17	199		24·5
	5	1	15	19	21	19	14	5	17	18	19	18	171	1109	25·8
36. Mrs. W. V. Hopkins (0), Westmead : White Leghorn. Market Value, £5 12s. 1d.	21	11	15	5	21	24	23	20	24	9	0	21	194		25·8
	0	4	10	8	0	1	0	0	0	0	0	0	23		24·8
	7	18	17	5	25	26	26	28	5	8	0	0	165		24
	1	6	23	19	20	21	22	21	22	25	19	16	215		25·7
	14	21	21	20	22	25	25	26	27	24	23	22	270		24·5
	1	18	20	21	18	20	19	8	14	20	23	23	205	1072	24·7

* Bird replaced ; score struck out. † Bird died ; not replaced.

SIXTEENTH ANNUAL COMPETITION—*continued.*

Section A (Light Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen.
															oz.
37. J. McGregor (0), Brookvale, Manly: White Leghorn. Market Value, £5 9s. 3¼d.	16	7	16	10	19	18	10	16	9	14	13	9	157		24·8
	0	6	12	1	13	9	5	5	15	12	13	14	105		25·8
	7	11	21	20	22	24	24	25	27	24	19	23	247		24·1
	19	17	21	18	22	24	25	5	7	8	6	1	173		25
	8	7	14	12	22	23	26	22	25	19	21	18	217		25·7
	13	8	15	12	17	14	10	13	17	12	6	9	146	1045	28·4
38. J. J. McKenna, Junior (1), Rouse Hill: White Leghorn. Market Value, £5 6s. 5d.	12	8	19	23	24	23	24	25	26	23	23	27	257		24·3
	12	18	10	16	18	15	20	19	23	17	12	17	197		25·2
	18	14	14	4	24	21	22	22	24	21	20	18	212		25
	5	3	7	15	21	21	20	21	21	18	9	9	170		22·8
	17	0	0	0	4	13	0	3	0	0	0	0	37†		24
	0	0	0	4	23	21	22	20	23	25	22	20	170	1043	26·7
39. S. McIlwraith (2), Hoxton Park: White Leghorn. Market Value, £5 11s. 5d.	9	19	19	20	11	0	0	0	0	0	0	0	78†		27
	1	3	20	24	27	19	24	23	26	20	19	21	227		22·4
	0	0	11	15	15	15	15	21	24	17	20	15	168		27
	19	20	22	23	26	25	26	23	25	21	23	23	276		24
	5	10	17	18	19	16	12	20	21	21	17	21	197		24
	14	18	17	16	14	11	5	0	0	0	0	0	95†	1041	24
40. D. Chrystal (0), Punchbowl: White Leghorn. Market Value, £1 10s. 9¼d.	2	0	1	0	20	20	23	14	6	6	0	0	92		26·2
	3	17	7	9	20	22	21	22	26	23	10	0	180		25
	1	0	14	20	22	23	24	23	25	21	6	21	200		26·7
	16	10	20	16	21	23	22	18	17	13	4	1	181		27
	8	17	17	16	17	20	12	20	12	8	5	3	155		25·8
	11	0	0	10	12	10	5	0	12	19	11	25	115	923	24

† Bird died; not replaced.

Section B (Heavy Breeds).

															oz.
1. C. Judson (0), Thornleigh: Black Orpington. Market Value, £8 12s. 3d.	14	23	27	29	29	22	26	22	23	20	14	17	266		24·3
	6	0	22	26	29	25	23	22	21	7	26	19	228		28·8
	0	23	24	22	29	25	22	11	25	13	10	7	211		26·4
	25	26	26	28	27	27	29	27	24	18	28	27	312		25·2
	17	25	24	27	27	30	28	24	27	26	23	27	305		26·2
	23	23	23	23	29	29	26	24	27	11	26	27	291	1613	24·3
2. G. Hopping (0), Ingleburn: Black Orpington. Market Value, £7 10s. 5¾d.	3	0	17	23	24	21	23	24	13	21	22	22	213		27·5
	11	22	21	22	20	24	19	21	24	21	17	14	236		28·6
	9	8	18	21	22	21	21	23	18	20	17	17	215		27·6
	21	25	21	25	26	28	28	26	19	14	25	12	270		24
	8	21	22	23	25	22	22	23	13	21	23	20	243		27·6
	22	23	20	25	23	25	25	18	22	19	5	18	245	1422	26·5
3. P. C. McDonnell (0), Beecroft: Black Orpington. Market Value, £7 4s. 9¼d.	12	21	20	20	25	25	25	23	23	18	22	19	253		27·5
	0	17	13	20	22	22	23	18	13	17	22	15	202		24·3
	4	12	13	15	21	24	25	25	27	22	17	11	216		25·2
	9	20	24	27	27	20	19	22	19	25	25	6	243		26·8
	4	26	23	26	27	25	21	23	24	9	18	23	249		24
	21	22	12	20	22	24	13	19	19	9	14	17	212	1375	24
4. E. F. Silcock (0), Tenterfield: Silver Wyandotte. Market Value, £7 0s. 7¾d.	0	0	0	20	26	27	23	26	16	23	24	29	214		25·4
	13	16	22	21	25	25	26	26	9	23	23	22	251		24·9
	8	16	19	20	23	24	21	22	14	19	20	25	231		26
	0	8	22	21	21	11	22	20	20	22	5	16	188		24
	2	9	21	23	26	24	25	24	24	22	20	23	242		24·9
	19	11	23	25	24	24	26	25	24	6	11	26	244	1370	24
5. A. R. Miles (0), Sefton Park: Black Orpington. Market Value, £7 5s. 1d.	1	7	21	20	19	9	22	21	14	13	14	11	172		25·2
	23	20	18	17	21	23	12	25	13	15	18	21	226		27·5
	23	13	20	24	26	17	19	16	16	10	24	9	217		24
	26	21	24	28	27	26	26	21	28	19	19	8	273		28·2
	25	20	11	22	24	25	26	12	15	23	24	24	251		27·4
	23	19	0	21	27	23	16	12	14	14	11	12	192	1331	25·2
6. J. Roberts (0), Wentworthville: Black Orpington Market Value, £6 19s. 4½d.	6	1	18	25	16	15	11	8	16	12	19	15	162		29·6
	24	24	22	21	24	23	25	16	21	18	10	22	250		27·3
	0	23	12	20	28	23	27	24	26	24	24	23	254		24
	0	12	6	15	21	25	21	24	21	11	17	19	192		26·9
	11	22	23	20	22	23	17	15	17	10	23	14	217		26·4
	20	22	20	22	23	17	21	19	17	9	16	21	227	1302	26

SIXTEENTH ANNUAL COMPETITION—*continued.*

Section B (Heavy Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen. oz.
7. J. T. Brett (0), South Granville: Black Orpington. Market Value, £7 2s. 0d.	16	24	22	22	25	19	22	20	11	8	16	13	218		25·5
	18	14	24	7	29	10	21	18	10	3	25	5	184		25
	20	22	23	3	24	25	24	12	18	15	11	0	197		24·8
	23	25	25	25	26	19	24	13	12	13	4	24	233		20·9
	22	22	20	15	20	23	23	20	25	24	23	22	259		24·8
	11	24	13	7	26	24	13	12	16	14	18	13	191	1282	22·4
8. H. Bastin (0), Sefton Park: Croad Langshan. Market Value, £6 17s. 1¼d.	11	26	22	24	24	24	18	23	14	21	13	20	240		26
	14	25	23	23	25	26	22	15	13	19	21	20	246		24·3
	9	24	24	26	27	21	12	13	22	12	7	20	217		27·6
	20	25	23	25	28	22	22	18	15	15	11	1	225		21·6
	0	5	20	22	26	11	17	13	12	13	5	16	160		27·8
	0	0	16	19	22	21	12	22	24	18	16	23	193	1281	26
9. T. Pritchard (0), Lawson: Black Orpington. Market Value, £6 10s. 6¾d.	1	12	19	18	22	23	20	10	13	16	10	15	179		24
	8	5	19	20	21	24	25	24	26	19	18	23	232		25·2
	9	9	26	26	26	27	18	19	18	22	15	18	233		27·8
	4	0	4	15	21	23	19	20	24	10	23	19	182		24·9
	7	23	24	21	25	26	25	22	22	20	19	15	249		24
	0	11	19	18	19	22	18	21	22	6	23	26	205	1280	26
10. E. D. Green (0), Hornsby: Black Orpington. Market Value, £7 0s. 2¾d.	12	21	19	19	21	22	22	15	24	22	22	22	241		24
	21	21	22	23	26	26	19	19	19	17	10	25	248		25·8
	18	23	13	0	6	18	18	13	15	17	13	9	163		26·2
	24	8	13	20	26	21	16	18	16	7	19	6	194		26·2
	22	25	3	13	23	26	24	21	29	26	22	24	258		24
	16	22	9	16	20	11	21	13	14	6	11	11	170	1274	25·4
11. A. Hughes (0), Blacktown: Black Orpington. Market Value, £6 12s. 4¼d	17	23	6	16	23	11	17	15	15	9	13	18	183		24
	23	21	23	24	28	22	27	16	26	12	25	24	271		25·2
	19	15	18	24	25	21	20	18	13	21	18	23	235		25·8
	0	0	2	17	23	21	20	19	23	21	20	17	183		24·8
	0	2	27	26	25	26	24	23	24	20	25	21	243		27
	0	0	22	19	10	17	18	16	15	14	10	11	152	1267	24·4
12. G. E. Holmes (0), Longueville: Black Orpington. Market Value, £6 11s. 2¾d.	7	10	17	21	25	24	16	22	22	20	23	13	220		25·1
	9	11	22	24	27	26	21	26	25	19	10	3	223		24
	0	5	23	20	24	24	16	17	3	10	18	12	172		25·2
	5	23	25	25	26	24	21	12	15	19	12	24	231		25·6
	18	26	23	25	20	21	4	22	11	22	11	23	226		24
	9	0	16	12	27	20	23	25	21	15	18	7	193	1265	26·4
13. R. W. Ray (0), Carlingford: Silver Wyandotte. Market Value, £6 7s. 10¼d.	1	0	0	21	28	16	22	18	12	12	13	11	154		24
	6	10	18	15	22	24	19	21	16	18	6	22	197		24
	21	20	22	22	25	27	25	22	25	20	12	23	264		24
	12	14	19	19	19	24	13	26	9	22	22	14	213		25·8
	12	19	15	23	25	20	18	24	14	11	22	9	212		24
	0	9	20	22	25	24	20	23	17	13	20	9	202	1242	24·3
14. D. Kenway (1), West Pennant Hills: Black Orpington. Market Value, £6 8s. 10d.	1	6	18	20	19	12	9	7	12	11	16	15	146*		26·2
	2	16	20	17	22	25	26	27	29	24	23	20	251		24
	12	4	23	23	24	15	15	10	18	10	21	9	184		27·5
	18	4	21	23	26	19	22	21	19	16	9	24	222		25·1
	2	14	24	23	28	24	22	20	25	11	20	24	237		24·3
	8	25	24	22	28	26	22	14	5	8	7	5	194	1234	24·8
15. J. Turner (0), Moruya: Silver Wyandotte. Market Value, £6 15s. 3½d.	13	19	2	22	15	21	13	15	13	12	9	13	167		24
	22	26	26	23	27	18	14	2	0	0	0	0	158		24·9
	13	14	4	7	18	21	23	24	18	9	18	16	185		25·4
	20	19	21	20	25	19	23	19	17	13	18	2	216		24
	23	26	23	21	25	28	30	16	28	18	26	28	292		24
	15	22	20	14	27	9	25	16	19	21	8	15	211	1229	24
16. G. Howell (0), Wentworthville: Silver Wyandotte. Market Value, £6 4s. 9¾d.	0	11	24	9	17	18	13	19	11	15	15	14	166		19·7
	4	26	26	16	26	19	18	14	18	14	16	21	218		19·7
	0	6	25	27	28	25	26	25	25	10	22	21	240		24
	0	0	14	19	12	18	22	14	13	15	21	14	162		21·6
	0	15	23	25	22	24	26	22	20	20	19	21	237		24
	0	15	23	18	24	18	18	21	16	16	20	6	195	1218	20·9
17. J. England (1), Dundas: Buff Orpington. Market Value, £6 12s. 8¾d	24	25	23	21	22	21	22	21	18	14	11	18	240		26
	19	10	26	14	14	13	18	16	13	14	16	19	192		25·2
	17	22	2	30	15	22	20	15	16	8	19	4	190		24
	25	9	26	25	27	23	21	18	3	0	0	0	177†		24·8
	24	20	22	23	26	24	16	10	16	13	13	23	230		25·7
	23	17	18	3	17	17	17	8	11	13	15	1	160	1189	24
18. J. Gillies (0), Killara: Rhode Island Red. Market Value, £5 19s. 3½d.	0	0	0	19	25	16	18	13	10	11	12	18	142		27·1
	20	18	0	15	22	23	24	20	22	3	15	14	196		24·8
	0	25	23	23	24	24	23	23	22	21	21	15	244		26·4
	15	2	2	20	19	21	20	19	18	16	7	15	174		25·6
	2	6	23	21	23	25	28	24	15	24	22	18	231		26·4
	10	13	11	19	19	22	16	20	6	18	12	18	184	1171	24·8

* Bird replaced; score struck out. † Bird died; not replaced.

Sixteenth Annual Competition—*continued.*

Section B (Heavy Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen. oz.
19. F. Clayton (0), Blacktown: Rhode Island Red. Market Value, £5 19s. 2¼d.	13	23	12	7	23	27	28	26	27	25	21	19	251		24
	17	25	20	22	27	25	24	22	23	12	3	1	221		25·2
	23	22	18	24	24	22	20	18	21	19	18	18	217		25·2
	0	0	8	24	24	20	26	19	20	10	15	14	180		24·9
	0	0	1	7	23	24	11	12	23	0	0	0	101		25·2
	16	5	22	11	17	17	17	14	11	11	17	7	165	1165	25
20. C. Bloomfield (0), Willoughby: Black Orpington. Market Value, £5 19s. 8d.	12	19	20	20	24	24	26	17	25	4	23	22	236		24
	17	21	22	22	26	26	13	15	17	9	25	18	231		25·2
	4	0	0	2	27	27	20	22	14	17	26	1	160		26·9
	3	0	0	7	28	17	16	13	19	11	14	12	140		28·4
	6	18	20	24	25	18	16	16	17	1	7	21	189		24·8
	4	19	21	26	25	21	17	16	20	3	19	10	201	1157	25·6
21. A. Chick (0), Beecroft: Black Orpington. Market Value, £6 1s. 0d.	0	13	23	23	26	25	21	4	0	4	2	2	143		25·2
	0	0	21	24	24	25	25	24	13	8	22	4	190		25·7
	20	23	23	24	23	21	13	0	0	0	1	5	153		24
	0	20	23	23	24	24	12	15	16	17	6	22	202		24
	4	24	24	23	24	24	22	18	24	19	22	24	252		24·8
	12	20	22	18	18	20	22	20	12	8	19	11	202	1142	24·3
22. A. Benson (0), Ingleburn: Black Orpington. Market Value, £5 18s. 2½d.	0	0	4	24	29	29	27	11	24	8	26	10	192		24·5
	17	21	20	20	22	25	18	18	19	17	9	15	221		26·4
	2	11	20	24	29	12	1	9	6	16	3	7	140		26·4
	3	26	17	24	25	18	23	16	17	21	19	14	223		25·0
	5	14	23	23	19	19	17	12	19	8	23	13	195		22·4
	12	11	15	11	22	14	15	17	12	11	14	8	162	1133	24·4
23. H. C. Cameron (0), Wallsend: Black Orpington. Market Value, £5 15s. 7d.	0	22	19	19	16	23	22	12	22	17	14	11	197		27·6
	0	1	25	24	24	23	26	15	16	20	5	18	197		24·8
	0	21	24	18	22	26	10	9	5	8	5	8	156		25·1
	0	20	22	20	18	23	25	25	22	23	21	15	234		25·9
	0	0	9	20	24	24	23	20	20	19	9	13	181		25·3
	18	8	20	14	8	15	16	16	14	12	16	11	168	1133	27·4
24. A. R. Kennedy (1), Carlingford: Black Orpington. Market Value, £5 17s. 6½d.	1	0	0	16	20	24	25	23	12	23	6	23	173		28·1
	5	0	14	24	24	26	25	24	9	14	17	22	204		24·5
	1	0	0	0	0	0	0	0	0	0	0	0	1†		24
	8	28	26	14	29	18	30	12	16	24	14	8	227		25·3
	15	22	21	22	24	25	23	22	15	24	14	24	251		25·4
	24	26	25	24	25	14	17	25	15	21	14	28	258	1114	24
25. J. F. Dalrymple (1), Peakhurst: Rhode Island Red. Market Value, £5 10s. 2¾d.	0	0	12	23	24	10	20	14	13	6	19	12	153		24·3
	10	0	10	21	22	23	23	22	23	20	20	21	215		29·5
	23	23	13	1	12	15	25	12	27	8	22	15	196		25·4
	10	11	17	20	23	24	21	23	19	15	8	24	215		27·9
	15	10	8	8	24	24	24	13	16	16	16	8	182		24·9
	0	0	0	22	29	27	28	27	6	0	0	0	139	1100	24·5
26. L. H. Earl (1), Arncliffe: Black Orpington. Market Value, £5 9s. 7¼d.	0	0	0	18	22	16	7	0	0	0	0	0	63†		26·9
	1	21	24	23	27	28	21	14	16	18	17	4	214		27·5
	14	26	22	22	26	27	18	26	16	8	23	7	235		25·5
	2	0	0	9	26	24	22	19	19	18	15	18	172		25·8
	2	6	17	23	24	21	22	20	23	8	17	15	198		28·1
	18	22	14	20	24	22	21	21	20	8	14	1	205	1087	26·9
27. H. W. T. Hambly (0), Mascot: Plymouth Rock. Market Value, £5 14s. 3¾d.	12	14	16	16	18	19	22	22	22	18	14	18	211		25·1
	13	20	10	12	22	23	18	24	23	22	18	19	224		25·2
	5	14	7	11	19	23	26	25	16	10	12	17	185		24
	8	9	10	0	4	2	4	3	1	8	0	0	49		24
	5	21	24	22	26	26	22	19	18	19	22	23	247		26·1
	3	22	7	4	26	17	23	15	11	15	15	9	167	1083	26·9
28. Mrs. C. Ferguson (0), Longueville: Rhode Island Red. Market Value, £4 12s. 4d.	0	0	2	5	20	19	18	19	13	12	10	16	134		25·4
	0	4	21	12	8	23	24	24	25	25	20	6	192		21·6
	4	11	4	6	17	22	25	22	24	6	16	1	158		24
	0	0	13	23	26	26	16	12	14	11	17	19	177		24
	7	0	3	6	22	26	26	25	28	11	25	22	201		26·9
	0	0	0	0	19	27	19	23	22	23	13	14	160	1022	......
29. J. H. Madrers (0), Kogarah: Rhode Island Red. Market Value, £4 7s. 11¾d.	5	10	9	16	21	26	20	21	16	6	13	17	180		25·3
	0	5	1	7	9	22	21	24	23	8	16	12	148		24
	0	0	0	5	23	22	22	22	20	22	10	0	146		25·4
	0	10	19	19	21	23	21	20	14	10	0	0	157		25·2
	0	1	0	1	18	18	19	19	19	15	10	13	133		21·2
	0	0	18	17	21	25	20	21	21	20	9	17	189	953	24·8
30. A. M. Simpson (3), Pittwater: Black Orpington. Market Value, £5 10s. 10¾d.	21	23	25	21	21	11	19	20	15	12	13	19	220		24
	18	23	21	21	19	16	17	6	8	11	0	0	160†		22·4
	21	22	22	16	22	4	1	0	0	0	0	0	108†		20·7
	19	25	11	13	28	16	17	18	17	16	16	15	211		21·4
	22	18	22	22	18	16	11	7	18	16	8	20	198		24·5
	6	16	6	2	2	2	0	0	0	0	0	0	34†	931	26·7

† Bird died; not replaced.

Poultry Notes.

MAY.

JAMES HADLINGTON, Poultry Expert.

POULTRY farmers who have profited by the advice which was given in these notes last month will now have their breeding pens made up, or, at any rate, the female portion of the matings will be in the pens and many of the younger birds will have settled down to lay. Of course, many may have been laying more or less regularly for some weeks; if they are old enough to pen they should have laid quite a large number of eggs before this, and the eggs should have reached a normal average weight of over 2 oz., particularly in the case of those breeds which lay large eggs.

Small Eggs.

The poultry raiser who essays to work up a good stock of birds cannot afford to be careless of the size of the eggs used for incubation. An egg to be fit to set should approximate 2 oz. in weight; a little more is desirable. At the same time it does not follow that abnormally large eggs should be set, for as a matter of fact they are usually failures. One of the first signs of degeneracy in any breed is the laying of small eggs; no circumstance of blood, records, or quality should be allowed to override this rule.

In selecting eggs for setting there are, of course, other factors than size to be taken into account. A study of the egg will reveal much that will be a guide to the health of the hen that laid it. For instance, apart altogether from ill-shaped, double-yolked, and porous-shelled eggs, an egg faulty in any particular is at once an indication that something is wrong, and that something is generally connected with the health or breeding of the hen. Colour of shell in the varieties that lay brown eggs is often a tell-tale in this respect; pale-coloured eggs might, for instance, be the result of foreign blood, or the lack of pigment. Even the latter would still indicate that the health of the hen is not all that it should be. But apart altogether from conditions of the shell and colour, there is a poverty of shell that often denotes an anæmic condition of the hen. Such eggs are unfit for incubation, because even if they manage to hatch, they mostly result in a poor class of chicken that will be more or less difficult to rear, and if they are reared they are unlikely to prove profitable stock.

The Age of Eggs for Incubation.

It may be as well to point out that eggs to be incubated artificially should be set within seven or eight days of their having been laid. It is found that the staler the egg, other things being equal, the less satisfactory results are obtained when set in incubators. At the same time, similar eggs, if kept for three weeks and taken care of, would usually have hatched a good percentage under hens. Many beginners not versed in the ways of detecting the stale from the fresh egg when purchased often obtain poor results in this way.

There should, however, be no difficulty in determining within reasonable limits the age of an egg; this can be done by the examination of the air space in a tester before a strong light. An absolutely fresh egg will show the smallest possible amount of air space in the air cell situate at the large end of the egg, probably not larger in diameter than an ordinary pea. As the egg becomes staler this space is gradually enlarged; at the end of a week, especially if the egg has not been taken care of and kept from draughts, it might be the size of a threepenny bit; while at the end of three weeks the same egg would probably show an air space as large as a sixpence, or even larger. Not only so, but it will be found easy to shake the contents of the egg in such a manner as to be audible to the ear, while in the case of a fresh egg scarcely any amount of shaking will loosen the contents of the egg.

If eggs are to be kept for incubation they should be protected from draughts. The best method of doing this is to use an egg cabinet; but failing that, one of the best ways of protecting eggs for setting is to stand them, large end downwards, in a bed of bran, and if they are to be kept long they will need to be wholly covered and turned daily after the first few days. This applies to keeping eggs for both artificial or natural incubation.

Winter Eggs.

How to obtain eggs in winter has probably exercised the minds of poultry-keepers for thousands of years, but, as has been shown in these notes, it is not possible to obtain the same number of eggs from a given number of hens, that is to say, of flocks, in the autumn and winter months as occurs in the spring. At the same time we can do much, as the last two laying competitions have shown, to raise the general average above that which was formerly secured. But this is not so much a matter of breed or strain. The idea that there is a winter layer and a summer layer should not be entertained; the only way to secure winter layers is by early hatchings, so that the pullets are sufficiently developed to come on to lay about April or May. This means hatching between the 1st of June and the end of September.

Looking Ahead.

At this season of the year every poultry-keeper should decide how many chickens he intends to hatch during the coming season, in order that he may provide sufficient brooder accommodation for his requirements; failure to do this is almost certain to result in loss.

The number of brooders required will, of course, depend upon their capacity and the length of time over which the hatching is to be extended; but assuming that it is intended to run three incubators, say of 110 to 140 each, and that normal results will be obtained, five or six brooders of 100 capacity, say day-old, will be required to handle them. Brooder accommodation of a good class is the most expensive item in poultry-farm equipment, but there is nothing of such vital importance to the welfare of the farm. True, many get through with somewhat doubtful appliances for brooding, but it is false economy to put in anything but the best equipment to rear chickens. Not only are good brooders necessary, but they require to be well housed; even the best brooders will probably fail to produce satisfactory results unless the housing is good, and provision made to have absolute control of the chickens accommodated in it. The floor space of such a brooder house should not be less than 13 feet in width, if 14 feet all the better. These measurements will allow sufficient margin for proper runs inside. A brooder house of less width than that mentioned will not give the required room for 75 to 100 chickens to be kept inside in bad weather; the inside run itself should not be less that 8 feet by 4 feet to accommodate that number. The 13 feet width of house would work out as follows:—3 feet for the passage at the back of the brooders from which to attend to them, 2 feet for the width of the brooder itself, and 8 feet length of run. The length of the brooder—4 feet—regulates the width of the run, thus supplying the area required.

If good brooders and housing cannot be obtained, the poultry farmer will do well to confine himself to the number his plant will rear successfully. Success or failure in poultry farming depends very largely upon successful earing. Good rearing means not only keeping so many chickens alive; much more than that is involved, because without good progressive development right from the shell the resultant adults will prove more or less unprofitable The prodigious waste that goes on in chicken life is probably the most important factor that makes for failure. If the actual loss of chickens was the only result the damage would be much less serious; but the conditions that kill off the weaklings will proportionately weaken those which were originally strong. This is a phase of chicken-rearing that we cannot afford to ignore.

SUDAN GRASS IN THE NORTH-WEST.

SOME time ago Mr. H. Maher, of Moira, Turrawan, North-western Line, obtained a small sample packet of Sudan Grass seed from the Botanic Gardens, and he has recently reported as follows:—

> Sown in rough fallow (slightly moist) by hand on 19th December. About 30 points of rain fell nine days after (28th), and it germinated rather patchily. It was sown on a slope which had three kinds of soil, the lowest a crumbly black (old swamp), then a stiff clay, and the highest ground was a clay bottom with about 6 inches of good loamy top. About an inch of rain fell on 15th January, and it made good growth till the 20th, when about ½ inch rain fell. It continued growing till it reached a height of 4½ feet on an average, but some plants were about 6 feet. No further rain fell, and it ripened its seed on 17th March. I gathered the seed by hand, and noticed that the most vigorous plants grew on the stiffer clay in the centre of the plot, but the greatest number of straws in the stools were on the loamy top portion. The lowest ground (old swamp) did not seem to suit it, but I am bound to add that it is badly drained. The highest stalks were on the clay in the centre of the plot, but they were very coarse—about as thick as an ordinary lead pencil. Those on the loamy ground were better stools, not so high, had more flag, and were only about as thick as a slate pencil. All classes of stock eat it greedily, but prefer the finer straw. It seeds freely, and apparently once it is up it needs very little rain to keep it moving.
>
> It was not cut or fed off except just to let animals taste it before it got very high.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bankstown.

A meeting of this branch was held on 18th March, when a lecture was given by Mr. Anderson, Hon. Secretary of the Lidcombe branch, on propagation. A vote of thanks was accorded to Mr. Anderson for his very interesting and instructive lecture.

A small peony dahlia show was held on the same evening, some very fine blooms being staged. The first prize was won by Mr. J. W. Cunningham, and the second by Mr. Witt.

Bimbaya.

A meeting of this branch was held on 21st February, when a general discussion took place on the management and care of milking machines. The conversation proved interesting and instructive to the members present.

On 26th February Mr. R. N. Makin, Inspector of Agriculture, gave a lecture on silos and silage, of which the following is a short report :—

Silos and Silage.

Mr. Makin prefaced his remarks by referring to the abundance of feed in the district this year. It offered opportunities for making meadow hay in large quantities. He instanced the manufacture of hay from the pastures by a number of English farmers in the vicinity of Moss Vale. When stacking the hay, salt was sprinkled over the surface at each 4 feet rise in the stack. The farmers who made and fed this hay to their stock assured him the stock ate it readily, and seemed to prefer it to green feed. He thought the same could be done in the Bimbaya district with profit.

There were many varieties of silos, some of them wasteful and others not sufficiently durable. In the Moruya district silos of all descriptions could be seen, and an opportunity was afforded of studying them side by side. The kind of structure he most favoured was an iron framework plastered over with concrete. The iron-work was of herringbone formation and held 2 inches of concrete on the outside, and 2 on the inside making a 4-inch wall that was almost indestructible. Unfortunately the ironwork, which was of American manufacture, was not now obtainable, owing to the war.

On some parts of the coast stave silos had given good results. The timber in some of those that he had inspected was spotted gum. The planks were deeply grooved and a tongue inserted. Iron hoops encircled the silo, provided with a screw device to take up the shrinkage. The chief fault with this kind of silo was that it permitted the juice from the silage to escape at the bottom, and made a dry silage.

Silos made by digging holes in the ground were called "pit silos." The chief difficulty with these was that while it was easy to fill them, the extraction of the silage was laborious. The better sorts were constructed by digging into the side of a hill. The silo then had three sides of earth and one side of wood. The woodwork could be placed so as to admit of its removal in sections, thus giving easier access to the silage. If a fairly deep trench was dug some 12 feet from the bank on the top side, so as to carry off rain-water, little or no trouble need be caused by wet weather. Silage absorbed moisture readily, and the accumulation of water from seepage through the earth walls, especially in granite country, would not be great. Perhaps the best feature in these silos was their cheapness, but a suitable spot could not always be found for constructing them convenient to the farm buildings.

Another method of making silage was simply to stack it. It was important in stacking for silage to make the stack as big as possible, and square and high rather than long and narrow. So important was the shape of the stack that it could make all the difference between good silage and no silage at all. The loss that ordinarily occurred through the air gaining access to the outer portions of a stack could be obviated in part by piling refuse round the stack and plenty of earth on top of it. The earth, if preceded by a layer of weeds, would not damage the silage. No mechanical devices for maintaining pressure were necessary. This covering on top also applied to tub and pit silos. It was, of course, necessary to protect a stack from the weather by thatching or some other form of roof.

Cattai.

At a meeting of the members of this branch, held on 10th April, it was decided to compete at the Hawkesbury District Show, notwithstanding the fact that much of the produce had been spoiled by a hailstorm early in the season. A discussion took place regarding citrus canker, and it was decided it was in the interests of this State that effective measures should be taken against the introduction of the disease to the orchards of the eastern States.

French's Forest.

A meeting of the above branch was held on 23rd March, when two new members were enrolled. Members of the branch were very pleased with the case of insects recently received from the Department, and intimated that they looked forward to a lecture by the Entomologist.

A paper on strawberry culture was read, and a very useful discussion took place in regard to it.

Glenorie.

A meeting of the above branch was held on 23rd February. After disposing of the general business, a discussion took place on the question of cheaper fruit cases. Nine new members have been enrolled since October last.

Kyogle.

At the March meeting of this branch a paper was read by Mr. James Simes, Manager of the Kyogle Dairy Company, on the care of cream and how to prevent its being graded as inferior.

INFERIOR CREAM.

MR. SIMES said the condition of the great bulk of inferior cream was attributable to want of cleanliness in the dairy, the yards, or the utensils. He found dairymen were not anxious to receive instruction as to the best methods to be followed in the production of high-class cream, and he cited a case in which he had sent out instructive circulars on the subject, and later had discovered in conversation with some of the suppliers that they had not even opened the circulars, much less read them.

One supplier came to him complaining of having received a large proportion of second class cream returns, and on examination of the can of cream sent in that day, a piece of the stick used for stirring the cream was found in the cream. It was about a foot long, and in a filthy condition.

Mr. Simes pointed out that wooden stirrers should not be used. The better plan for mixing cream was to transfer it from one can to another. If it had to be stirred, a metal stirrer should be used. He believed it would pay the directors of butter factories to engage a man with a thorough knowledge of the proper care of cream to travel the dairy districts, and advise farmers as to the proper method of manufacturing first-class cream.

In reply to numerous questions, Mr. Simes gave some further useful information on the subject.

At the recent Kyogle show the branch staged a very fine trophy of farm, dairy and orchard produce, which attracted much attention, and occasioned many favourable comments from visitors. The exhibit was afterwards sold on behalf of the Red Cross, whose funds will thereby benefit to the extent of £5 10s.

Lidcombe.

A meeting of this branch was held on 11th March, when a lecture was given by Mr. A. A. Hamilton on the work of a herbarium and the members who attended the meeting were much pleased and entertained with what they heard. They were somewhat surprised at the wide scope of work embraced in an institution of this kind.

Three new members were enroll d at the meeting.

A meeting of this branch was held on 25th March, when an interesting lecture was delivered by Mr. C. W. Phillips on bee-keeping.

At a meeting held on 8th April, and attended by forty-five members, a paper on artificial manures was read by Mr. V. Green. A very pleasant evening was spent, and an animated discussion ensued. It was decided to give hearty support for Red Cross Day by running a stall. Three new members joined the branch.

Matcham.

At a meeting of this branch, held on 23rd March, a paper was read by Mr. J. S. Heath on how to plant fruit trees; and another was read by Mr. W. R. Crossland on onion culture. A useful discussion followed each paper.

Moss Vale.

A meeting of this branch was held on 5th April, but owing to the inclement weather only a few members were present. Ten new members were enrolled, bringing the total membership up to 100.

The lecture given by Mr. W. le G. Brereton, Assistant Fruit Expert, on 14th March, was attended by about sixty persons, including a number of ladies, and was very much appreciated.

Quaker's Hill.

A well-attended meeting of this branch was held on 2nd March, when a lecture was given by Mr. Tanner on the breeding and raising of cattle. In sympathy with local interests the lecturer dealt chiefly with dairy cattle, and incidentally with the family cow. It was advocated that Jersey heifers be served by the bull when 18 months old, and Shorthorns when 2 years old. The use of bulls other than pure-breds was strongly discouraged. Grass should not be wasted, but should be cut and cured as hay. Rearing poddies on spare milk and disposing of them as they grew was sound business, especially at the present time.

Spencer.

A meeting of this branch was held on 23rd March, when a paper was read by Mr. S. M. Kelly, of which a summary follows:—

CATTLE BREEDING.

The high price of cattle at the present time offers every encouragement to breeders to rear nothing but the best.

The breeding of pedigree stock is the application of some of the hidden principles of nature, so as to produce animal forms that are as nearly as possible perfect. Nothing short of a careful study of pedigree and the laws which govern the reproduction of animals, will enable a man to tell with anything approaching to accuracy what will be the result of a cross between two animals of different families which are or are not related. Sometimes the most promising and likely mating of two animals will turn out unsatisfactorily, while in other instances the result will be more gratifying than could have been expected. It is always well to bear in mind that "like produces like"—that is, more or less influence is always exerted by the parents on their offspring. In any case, it is a mistake to breed from weakly or delicate animals.

The establishment of a good herd of cattle at the present time is by no means an easy matter. A man is frequently asked—what is the best breed of cattle to go in for? No more indefinite query could be put, because the breed of cattle that suits one farmer will not suit another. A good deal depends on what is being catered for—the butcher or the dairyman, or both. If it is for the butcher, the Devon or Shorthorn-Devon cross would be suitable for this district. Dairying is being extended nearly all over the State, but those engaged in the business will not dispose of really first-class cows or heifers.

The breed of cattle to be selected will depend, to a great extent, upon the locality, climate, richness of pasture, &c. It would be almost absurd to expect large animals to find a living on poor herbage. The Milking Shorthorn is becoming very popular in Australia. The Ayrshire and the Jersey are very popular with dairy farmers, and if milk and butter are the principal objects in view, I know of no better breeds. Some breeders like grades or crosses. The Shorthorn and Devon make a good cross for beef. If breeding for the dairy, I prefer the Shorthorn-Jersey cross; if for general purposes, I like the Shorthorn-Ayrshire cross.

It must always be remembered that the bull is more than half the herd, and whatever breed he may be, he must be pure-bred, for no other is reliable or possesses ability to transmit the required characteristics to his progeny. The heifer calves of a pure-bred bull should all be reared, and if they in turn are put to pure-bred bulls, a high-class type of cattle will be obtained in the course of a few generations. All kinds of stock do best in the locality where they are reared, and it is undesirable to bring stock from a rich to a poor pasture, as they will be sure to deteriorate. A farmer should never sell his heifers from his best cows, as he requires them to be the foundation of his future herd.

Some stockowners like inbreeding on certain lines, and, of course, some of the most celebrated cattle in the State have been obtained in that way. I have had only a slight experience in that line of breeding, and I do not like it. One may get a few first-class animals, but it will be at the expense of the herd in general. Of the offspring, 80 per cent. will be weedy and subject to ailments. I like a fresh sire in the herd every three years. If inbreeding is followed at all, I think it preferable to rear a young bull from one of the best cows and to use him in the herd—not mate the old bull with his heifers. A bull should be 2 years old before being used for stud duty. A heifer should be at least 2 years and 3 months, so that she will be 3 years old when she has her first calf. When selecting a bull, see that he is fairly large of his class and muscular. The head should be masculine, but not coarse, the neck somewhat long rather than short, the skin moderately thick but of a soft, yielding character. The escutcheon principle of judging the milking qualities of a cow is just as valuable in determining the value of the male.

The following are some of the points of a good Milking Shorthorn cow:—Colour, roan, red or spotted; wedge-shaped, square and heavy behind; light brisket; neck long and thin; full eyes; intelligent looking; well defined, prominent milk veins; teats 3 or 4 inches apart; deep flank; big round body—this is very important; escutcheon or mirror well out on sides of flank to root of tail.

I have often been asked what is the cause of so many whites appearing among the Milking Shorthorn. Competent judges say that the roans originated from mating the red and white. White mated with red gives practically all roans; roan mated with roan gives 25 per cent. white, 25 per cent. red (including red and white), and 50 per cent. roan.

Springside.

A meeting of this branch was held on 26th March, when Mr. T. C. Bowen read a paper on hay wheats suitable for the district.

Tallong.

At a meeting of this branch, held on 6th April, a general discussion took place upon the exhibition of fruits at the recent Royal Agricultural Show, Sydney. Those members who had visited the Show expressed themselves as highly pleased with the exhibit staged by the Department, which they considered was most impressive and educational.

It is gratifying to be able to note the success of this branch at the Royal Show. The first prize for district exhibits of apples was divided between Tallong and Goulburn. Every apple exhibited was grown within a three-mile radius of Tallong railway station.

The first prize for the best case of pears for export was won by Tallong, and the first, second, and third prizes for the best case of apples for export also came to the members of the branch. Numerous other prizes for fruit were won by members, who, roughly speaking, won about £100 in prize money.

Toronto.

Ten members were present at the meeting of the above branch on 5th March. General business was transacted, after which a very interesting discussion on agriculture took place, the speakers being Messrs. Filmer, Donnelly and Froome. Much appreciation was shown by the members present.

On 28th February a party of ten members from the branch visited Hawkesbury Agricultural College. The visit proved to be both educative and interesting, and was much enjoyed by all in the party. As a result of the visit several members intend installing heating apparatus for brooding chickens similar to that used at the College.

At a meeting held on 9th April one new member was added to the roll. A general discussion took place on vegetable growing. It was stated that aphis and fly had been bad on turnips, and Mr. Potter stated that he had cleared his plots by spraying with liquid from boiled lettuce.

A very interesting demonstration of the gathering of vegetable seeds was given by Mr. Cockburn. He suggested that growers should raise seed for their own requirements, taking care to select the best of each variety. Mr. Cockburn also gave particulars regarding his method of cultivating herbs.

Windsor.

The first business meeting of the above newly-formed branch took place on 22nd March, when eight new members were enrolled.

Mr. W. H. Spinks read a paper on the preparation of the soil for maize, at the conclusion of which an animated discussion took place.

Woonona.

A meeting of this branch was held on 12th March, there being a good attendance of members.

The Woonona branch of the Red Cross League wrote expressing thanks for being allowed to control the refreshment stall at the late show. The sum of £9 1s. 1½d. was realised in aid of sick and wounded soldiers and prisoners of war.

After the business of the meeting had been disposed of, a general discussion on poultry took place. Messrs. Fowler, Walton, Moss, Biddulph, and the Chairman (Mr. Cameron), each gave their experiences, and the members present were much interested.

Four new members joined the branch during the month of March.

Yarramalong.

This branch held a meeting on 20th March, when eighteen members were present. The Chairman read a report of the Yarramalong village exhibit entered by the branch in the Wyong show. The season had been extremely wet, and a great deal of produce had been destroyed by floods; members, therefore, were not certain that the exhibit would be worth entering, but contrary to expectations a fine lot of produce was brought forward, the vegetable sections especially being strongly represented. The display of jams, jellies, and preserves was indeed a credit to the ladies, and was commented upon by the Minister of Agriculture in his opening speech.

Orchard Notes.

MAY.

W. J. ALLEN.

Preparation for Planting.

IF the land intended for planting this season is not already ploughed and subsoiled, this work should be done at once, so that the planting of deciduous trees may be completed during the month of June. The roots of young deciduous trees, if examined, will be found to be making growth during June and July, and if planting is carried out early in the winter, this root growth enables the tree to obtain a good hold of the soil, and they make a strong top growth right from the time they commence to start in the spring. The selection of varieties to be planted should be made, and the order placed with the nursery without delay, if that has not already been done. In selecting, ascertain varieties which sell most readily on the markets, and then choose those which are most suitable for the soil and climate.

Fencing.

The orchard should be securely fenced, in order to protect it from damage by stock. Where rabbits and hares are prevalent, wire netting will be necessary. This should be sunk in the ground to a depth of 6 inches; it should not be less than 3 feet high, and the mesh should not be larger than 1¼ inches. All gates should shut closely; even with these precautions, a constant watch should be kept for any rabbits or hares that may manage to get inside the fences, so that they can be destroyed before they damage the trees.

Dormant Buds.

The wraps on buds, either in nursery stock or old trees, may be removed now.

Woolly Aphis.

This pest generally gets ahead of the orchardist during the busy part of the fruit season, when it is almost impossible to attend to it. In these cases the trees should be sprayed as soon as the crop is gathered. This should be done with a high-pressure spray, the nozzle being held very close to the affected parts of the tree. When spraying in this manner a large quantity of spray is used, and on big trees quite a pool of mixture will accumulate at the base of the tree by the time the spraying is completed. For this reason it is safer, when cleaning up badly infested trees, to use a tobacco wash rather than an oil spray when dealing with this pest.

Codlin Moth.

Although the apple and pear crop may be harvested, the bandages should be kept on the trees. Many grubs will be found sheltering in the bandages, having been driven out of other hiding places by the cold weather and winter rains.

Harvesting.

In the tableland district there will still be late varieties of apples, such as Yates and Granny Smith, to harvest. The winter crop of passion fruit will be coming in this month. The fruit should be regularly picked as it reaches a uniform black colour.

Drainage.

The past wet summer will have probably shown where wet patches are likely to occur in the orchard. These patches should be marked and an effort made to provide underground drainage when work slackens after the fruit season is completed. Good underground drains may be made with broken stones or unglazed agricultural drain-pipes.

Pruning.

In large orchards, and when one anticipates a shortage of help and difficulty in getting through the winter operations of pruning, spraying, and ploughing, a start may be made with the pruning of those varieties of peaches, apricots, and plums that lose their foliage early, though it is a safer practice to leave this work till later, when danger of unseasonable warm weather has passed and the consequent risk of the buds bursting during autumn is over.

When pruning the peach, it should be remembered that it chiefly crops on the previous year's laterals, and not on old spurs; thus it is necessary to keep up a yearly supply of young laterals. This can be done if the old laterals are taken out regularly each winter pruning, when young laterals will start from the dormant eyes at their bases. Care should be taken, when cutting out the old laterals, not to cut close enough to damage the dormant eyes. In seasons when there is a bad showing of fruit eyes, it will be necessary to leave some of the 2-year-old laterals, which are carrying sublaterals, or temporary spurs showing fruit eyes; but this is to be avoided as much as possible, for the longer the laterals are allowed to remain after the second year, the harder it is for the dormant eyes at the base to start into growth. If the trees have been topped at the previous pruning, it will probably be necessary for a number of leaders to be thinned out this season, for if the top is allowed to become too thick the trees will not furnish fresh laterals along the main branches too readily. It has also been found that in very vigorous trees which have their shape well established, it is well to only thin the leaders out and not top them back for a season. This non-topping also encourages the furnishing of laterals below.

The apricot crops both on the previous year's laterals and on older spurs, but on most varieties the tendency is for these spurs to die out after two or three seasons, starting from the base of the laterals; consequently the laterals soon only produce fruit towards their tips. This may be avoided by following a system of renewal, very similar to that described for the peach.

Plums, with some exceptions, develop permanent fruiting spurs. These can generally be obtained by leaving the laterals long in the trees, and shortening them back in later years when the spurs are established and the trees are making less growth.

In older trees, where spurs have multiplied too numerously, they should be thinned out in order to prevent oversetting and consequent small fruit; exhausted spurs should also be removed, to encourage the growth of new spurs or laterals which will subsequently form fresh spurs.

When loquats have blossomed and the setting is heavy, it is advantageous to thin out by systematically going through the trees and removing the branchlets where they are spaced too closely. In doing this an endeavour should be made to work back towards the parent branches, and not to continually work out from them. Such thinning of the tree is not always sufficient, and reducing the fruit on the bunches may be necessary. If in some trees this is done by removing the fruit from the apex, and in other trees from the base of bunches, the range of period of ripening is lengthened.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
Dubbo P., A., and H. Association	F. Weston	May 8, 9
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 9, 10, 11
Nyngan and District P. and A. Association	E. Costelloe	,, 22, 23
National A. and I. Assn. of Queensland (Brisbane)	J. Bain	Aug. 12–17
Trundle P. and A. Association	W. E. Herborn	,, 13, 14
Corowa P., A., and H. Society	J. D. Fraser	,, 20, 21
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 27, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 3, 4
Grenfell P., A., and H. Association	G. Cousins	,, 3, 4
Ganmain A. and P. Association	T. S. Henderson	,, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson	,, 10, 11, 12
Young P. and A. Association	T. A. Tester	,, 10, 11, 12
Cowra P., A., and H. Association	E. W. Warren	,, 17, 18
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 17, 18
Temora P., A., H., and I. Association	A. D. Ness	,, 17, 18, 19
Holbrook P., A., and H. Society	J. S. Stewart	,, 19, 20
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25
Yass P. and A. Association	E. A. Hickey	,, 26, 27
Ardlethan and District P. and A. Society	W. J. Nixon	Oct. 2
Deniliquin P. and A. Society	P. Fagan	,, 2
Hay P. and A. Association	G. S. Camden	,, 9, 10
Lismore A. and P. Society	H. Pritchard	Nov. 20, 21

1919.

Society.	Secretary.	Date.
Kiama Agricultural Society	G. A. Somerville	Jan. 25, 27
Southern New England P. and A. Association (Uralla)	H. W. Vincent	Feb. 25, 26, 27
Tenterfield P., A., and M. Society	R. S. Smith	Mar. 4, 5, 6
P. and A. Assn. of Central New England (Glen Innes)	G. A. Priest	,, 11, 12, 13
Armidale and New England P., A., and H. Assocn.	A. McArthur	,, 18, 19, 20, 21
Quirindi District P., A., and H. Association	A. Pountney	April 2, 3, 4

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3rd June, 1918.

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VOL. XXIX. PART 6. JUNE 3, 1918.

Agricultural Gazette of New South Wales.

Water on the Farm.

[Continued from page 310.]

F. B. GUTHRIE.

WATER FOR HUMAN CONSUMPTION—*continued.*

Peaty Water.

PEATY water is charged with organic matter of vegetable origin. There is some conflict of opinion as to the danger run in using such water for drinking purposes. Epidemics of diarrhœa have been traced to the use of peaty waters as the water supply. Peaty waters are soft waters, and the consensus of opinion appears to be that they can be drunk without risk, provided they are free from animal contamination and do not undergo putrefaction on keeping. They have a high solvent action on metallic lead, and leaden pipes and vessels must be avoided. Water from swamps, or stagnant water in which animal and vegetable matter flourishes and decays, is, of course, always dangerous without preliminary purification. Many peaty waters have been credited with curative properties for complaints such as rheumatism and for skin diseases. Unless such water is spring or running water, it must, however, always be regarded with suspicion, and it is likely to become dangerous if stored.

Order of Safety of Natural Waters.

The different types of water which we have been discussing may be roughly classified as follows with regard to their safety or otherwise as a supply for drinking purposes:—

Safe.—Spring waters.
Fresh rain water.
Deep well waters.
Rivers or lakes in hilly districts.

Suspicious.—Stored rain water.
Surface water from cultivated land.
Peaty waters.

Dangerous.—Shallow well water.
River or other water to which sewage has access.

In all cases the water used must be absolutely beyond the possibility of danger of sewage contamination or of contamination by waste water from manufactures or from mines, which is likely to introduce poisonous substances.

Storing.

All water, even filtered water, is liable to deteriorate on keeping. The reservoirs in which water is kept should be covered and protected from the light. This deterioration, due to the growth of micro-organisms and of vegetation, is more particularly liable to take place in hot climates. This is also true of water that has been boiled. Even distilled water develops growths when stored for any length of time in the one vessel. Long storage is, therefore, to be avoided, and the tanks or reservoirs in which drinking water is kept must be periodically cleaned out. The presence of carbonic acid in rain water retards the growth of micro-organisms to some extent, and rain water, which not only contains carbonic acid, but is generally well aerated, does not "stale" quite as rapidly as spring or river water when stored.

Filtered water can be protected from bacterial attack by the addition of bleaching powder at the rate of about ¼ oz. per 1,000 gallons.

If passed through an ozonizer the risk of subsequent growth is also much lessened.

Filtration.

All household filters require to be periodically and thoroughly cleaned, since whatever medium is employed becomes loaded with organisms in a longer or shorter time according to the purity of the original water, and becomes slimy and itself a seed-bed for the growth of micro-organisms, which gradually find their way down to the filtered water. The result is that when a charcoal or other filter has been used for any time without cleaning, the filtered water may be more impure than the original.

A filter which is not periodically cleaned constitutes a danger to the water supply rather than a safeguard.

Charcoal filters are not to be recommended, as they cannot be cleansed except by heating, and repeated heating reduces the filtering efficiency of the charcoal. Filters made of porous porcelain or diatomaceous earth are the most satisfactory, but these require that the water should be forced through under pressure or, at all events, with a good head of water. Of this type, the Chamberland-Pasteur, of unglazed porcelain, or the Berkefeld, made of diatomaceous earth (Tripolite), are the most effective. The advantage of this type of filter is that they are made in the form of a cylinder or candle which can be readily removed and cleaned by scrubbing and placing it in boiling water for a few minutes. This should be done once a week at least. Their disadvantage lies in the fact that filtration is slow and requires that the water should be introduced under pressure. The Berkefeld filter is the more rapid. With 50 feet of head (1½ atmospheres) a Berkefeld filter yields about 2 pints in a minute. Without any pressure it takes some hours to filter a pint.

Ozonizing and Sterilizing.

This is a very effective way of sterilizing water for human consumption, and apparatus is on the market in which water can be ozonized by electricity for household purposes. The flow of water through the ozonizer is not impeded as in the case of filters; and the working costs are small after the initial cost of the apparatus, provided that the current can be taken from the electric mains, but an electric supply is essential.

Water can also be sterilized by boiling. Sterilizers for treating water for household purposes on this principle are on the market, and the Forbes patent water sterilizer in which this principle is adopted is used by the United States army. Apparatus which will sterilize about 3 gallons per hour at a cost (using gas or petrol as fuel) of not more than 2d. per 100 gallons is on the market. Like the ozonizer, no cleaning is required, and the apparatus can be used continuously for years.

If there is any suspicion as to the purity of the water, the simplest and most effective treatment is to boil it.

Chemical Methods of Purification.

Lime.—As has been mentioned when the subject of water for boilers was under discussion, water that is hard owing to the presence of carbonate of lime can be softened by the addition of a further quantity of lime. This process is employed on the large scale in the softening of the water supply of many cities (Clark's process). For treating supplies for household purposes the procedure recommended for the softening of waters for boilers may be followed (*Agricultural Gazette*, April, 1918, page 232). It will not often be necessary to soften water for drinking purposes under our conditions. Where, however, the water is to be used for household purposes, especially for washing or for laundry purposes, and does not form a lather with soap, the addition of lime in the manner indicated is the most effective way of dealing with the trouble.

Permutit.—This substance is an artifically-prepared silicate of alumina and soda of the same composition as the minerals known as zeolites. It is prepared by fusing together quartz, kaolin, and carbonate of soda in definite proportions. This substance not only softens the water by removing the hardness due to carbonate of lime, but also removes iron and magnesium salts.

Bleaching-powder, Chloride of Lime, or Hypochlorite.—The action of bleaching-powder in rendering sterile water that has possibly not been satisfactorily filtered has been already mentioned.

Its use for unfiltered water which has undergone contamination is frequently resorted to. For such water, the addition of 1·1 grains bleaching-powder per gallon (2½ oz. per 1,000 gallons) has been found effective in destroying bacteria. Mix the chloride of lime to be used in a bucketful of water and add to the water to be purified, stirring during the addition. The objection to the process is that it depends upon the action of chlorine derived from the bleaching-powder, and very small traces of chlorine possess a highly objectionable odour and taste.

This odour will disappear on standing, particularly if the water can be aerated, or it may be removed by means of bisulphite of soda or hyposulphite of soda ("hypo"). The amount of this substance required will depend upon the amount of free chlorine present, and a small quantity of the water should be experimented with first. If only enough bleaching-powder has been added originally to sterilize the water, the amount of bisulphite required should be very small. If hypo is used about half the amount of the chloride of lime added is roughly sufficient.

The cost of treating the water as suggested, first with bleaching-powder and then with bisulphite of soda, has been calculated at about 1d. per 1,000 gallons. The action of the free chlorine is not only bactericidal, but it has the effect of destroying the organic matter, so that water so treated is less liable to decomposition than is untreated water. If organic matter is in suspension it should be previously filtered.

Ferrochlore, which is a mixture of bleaching-powder and perchloride of iron, is also used for the same purpose. The active agent is in this case also chlorine, and this has to be removed as above described.

Permanganate of Potash or Permanganate of Lime.—The action of permanganates, like that of the chlorine in bleaching-powder, is an oxidising one, and it acts similarly in destroying organic matter and as a bactericide. It also acts as a coagulant, an insoluble oxide of manganese being precipitated, which carries suspended matter down with it. It is, however, not so effective a coagulant as those which will be discussed immediately.

To purify water with permanganate, all that is necessary is to add the solution of permanganate in water in small quantities at a time under constant stirring, until the liquid assumes a light pink tinge which is permanent for five or six minutes. This pink colour will disappear on standing for some hours, and the water will be colourless. Permanganate of lime is more satisfactory, since permanganate of potash produces carbonate of potash, which is alkaline, whereas permanganate of lime forms carbonate of lime, which is thrown down and helps to clarify the water.

During the Ashanti war the following mixture was used by the soldiers for treating the impure water obtainable:—

1 part permanganate of lime.
10 parts sulphate of alumina.
30 parts fine clay.

Copper Sulphate (bluestone) is a highly effective algicide, and is used successfully in destroying algæ or similar vegetable growths which develop in stagnant water. The water in water-holes which have become infested with algæ may be cleared of these growths by the addition of 1 part in 10 millions of sulphate of copper—that is, 7 grains in 1,000 gallons will prevent the growth of algæ—and to destroy any already present as much as 1 part in 2 millions (35 grains in 1,000 gallons) may be used without introducing an appreciable amount of copper into the water or one that can have any poisonous action on human beings.

Coagulants.

The substances used as coagulants do not necessarily possess bactericidal functions. They are employed to clear turbid waters. Coagulants are commonly employed in connection with sand filtration of water supplies. Their addition facilitates filtration by causing the finely-suspended matter to aggregate and settle out. Even where filtration is not resorted to it is possible to clarify the water, the suspended matter being precipitated in the settling tank, from which the clarified liquid can be drawn off. Their clearing action is often quite striking. If to a glass of turbid water containing peaty matter, or very fine clay, in suspension a few drops of alum or ferric chloride be added, the suspended matter will settle quite rapidly and leave the supernatant water clear.

Sulphate of Alumina.—The precipitating action of sulphate of alumina (or alum), which is one of the coagulants frequently used, depends upon the presence in the water of carbonate of lime, which converts the alum into alumina (aluminium hydrate), which is insoluble in water and carries the finely-suspended matter down with it mechanically.

Owing to its price, the pure sulphate of alumina is being replaced by the cheaper "alumino-ferric."

Alumino-ferric is the name given to an impure sulphate of alumina which is prepared from a bauxite containing a rather high proportion of ferric oxide.

This substance is cheaper than sulphate of alumina and apparently quite as satisfactory.

As an example of its clarifying power, samples of water from the Canning Factory, Leeton, were examined for the Irrigation Commission before and after treatment with alumino-ferric. The original water contained a quantity of very finely-divided clay in suspension which did not settle and which could not be removed by passing through filters. The water was treated with alumino-ferric in the proportion of 6 ounces alumino-ferric to every 1,000 gallons of water. The treated water was perfectly clear, every trace of suspended matter having been removed. The effect of the alumino-ferric on the chemical composition of the water is shown in the following table:—

	Total solid residue. Parts per 100,000.
Water before treatment	15·4
Water after treatment..	12·0

Ferric Chloride.—Ferrous sulphate and oxide of iron are also effective coagulants. Ferric chloride (perchloride of iron) is particularly rapid and effective, and may be used in the proportion of 6 ounces to every 1,000 gallons for fairly turbid water.

Superphosphate of Lime (ordinary "super") is also an effective coagulant.

In the case of any of these coagulants, very small quantities only are required to effect the precipitation of the sediment, and no more than is necessary for the purpose should be added, as they will all impart a taste to the water if added in excess, and the water will be rendered acid and will attack the metal of the tanks and pipes. If any excess has been added lime or soda must be used to neutralise it. When the sediment has settled, the clear water may be drawn off and, if it is considered necessary, filtered. As stated above, these substances are not germicides, but effect a sterilization by carrying the micro-organisms down with the coagulum.

If the water was originally charged with micro-organisms it must be again examined bacteriologically before deciding on its safety as a drinking water. Before any coagulant is added it is essential that an analysis of the water be obtained, so that the proper amount can be estimated.

General Conclusions on Methods of Purification.

It will be seen from the above discussion of the various methods suggested for purifying water for drinking purposes that there is no means of sterilizing water with absolute certainty by filtration or by the addition of a germicidal substance. Pure water is always better than purified water. Filtering is only safe provided that the filtering material is frequently changed or cleaned—once a week at least, or oftener if the water is a bad one.

The question of storage is also one that has to be carefully considered, as water is liable to putrefy on storing.

The use of chemical germicides should not be resorted to unless it is possible to have the water periodically examined chemically and bacteriologically, as their use is likely to produce a false feeling of security. Where the object is to clarify water which is turbid with suspended clay, and there is no risk of organic contamination, one or other of the coagulants mentioned may be used with safety and advantage; but for purifying contaminated water for drinking purposes, the only safe procedure is to boil the water. It should not be a difficult matter, where drinking water for the household only is required, to fit up a boiler for this purpose. Subsequent passage through a filter will help to aerate the water and remove the flat, insipid taste characteristic of boiled water.

Boiling does not destroy the whole of the organic matter nor the saline matter in solution. This can only be done by distilling the water, converting it into steam and condensing the steam in a cooled pipe or worm. This, if properly carried out, yields absolutely pure water, but is usually too cumbersome and costly a process for general use. Distilled water also requires aeration to render it palatable to most people.

(*To be continued.*)

Popular Descriptions of Grasses.

[Continued from page 280.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE POA GRASSES.

The Poa grasses constitute another large genus of grasses with overlapping spikelets, as in the Fescue and Brome grasses previously described. They can, however, be distinguished from the latter in the fact that the grain falls completely free from the glumes or husks of the flower, whereas in *Bromus* and *Festuca* the grain is lightly attached to one of the flowering glumes or husks (called the palea), and it is generally sold and sown accordingly.

The Poa grasses are widely distributed over the cooler regions of the globe. Most of them are palatable, but Australia has the invidious distinction of possessing an indigenous Poa grass of very little value. This native Poa is one of the commonest and most widely distributed of our native grasses, and were it palatable like other Poas, it would mean a considerable amount of added wealth to the grazing community.

The principal Poa grasses found growing in New South Wales may be classified as follows:—

Useful—
- Kentucky Blue grass (*Poa pratensis*). (Fig. 1.)
- Texas Blue grass (*P. arachnifera*). (Fig. 2.)
- Canadian Blue grass (*P. compressa*). (Fig. 3.)
- English Blue grass (*P. trivialis*).

Of limited value—
- Winter grass or Goose grass (*P. annua*). (Fig. 4.)
- Native or Tassocky Poa (*P. cæspitosa*). (Fig. 5.)

KENTUCKY BLUE GRASS (*Poa pratensis*).

This grass is a native of Europe, which is now widely spread throughout the States of America, where it provides a very large portion of the cattle pastures in Kentucky and other States. In New South Wales it is grown mainly as a lawn grass, although in the more elevated tablelands it is coming into favour as a good pasture grass.

Kentucky Blue grass can be distinguished from most of the other Poa grasses by the fineness of its leaf and its creeping root system. Texas Blue grass also has the creeping characteristic, but it is a much coarser grass in every way than Kentucky Blue. The flowering spikelets of Kentucky Blue, in common with most Poa grasses, bear distinct tufts of cobwebby hairs at their bases. The grass seldom grows more than 2 feet high, and under average grazing conditions generally reaches a height of 6 inches to a foot, with a very thick sward. Variations in the fineness of leaf and thickness of growth, as seen in cultivated pastures, are common, and possibilities of selecting superior strains are very promising.

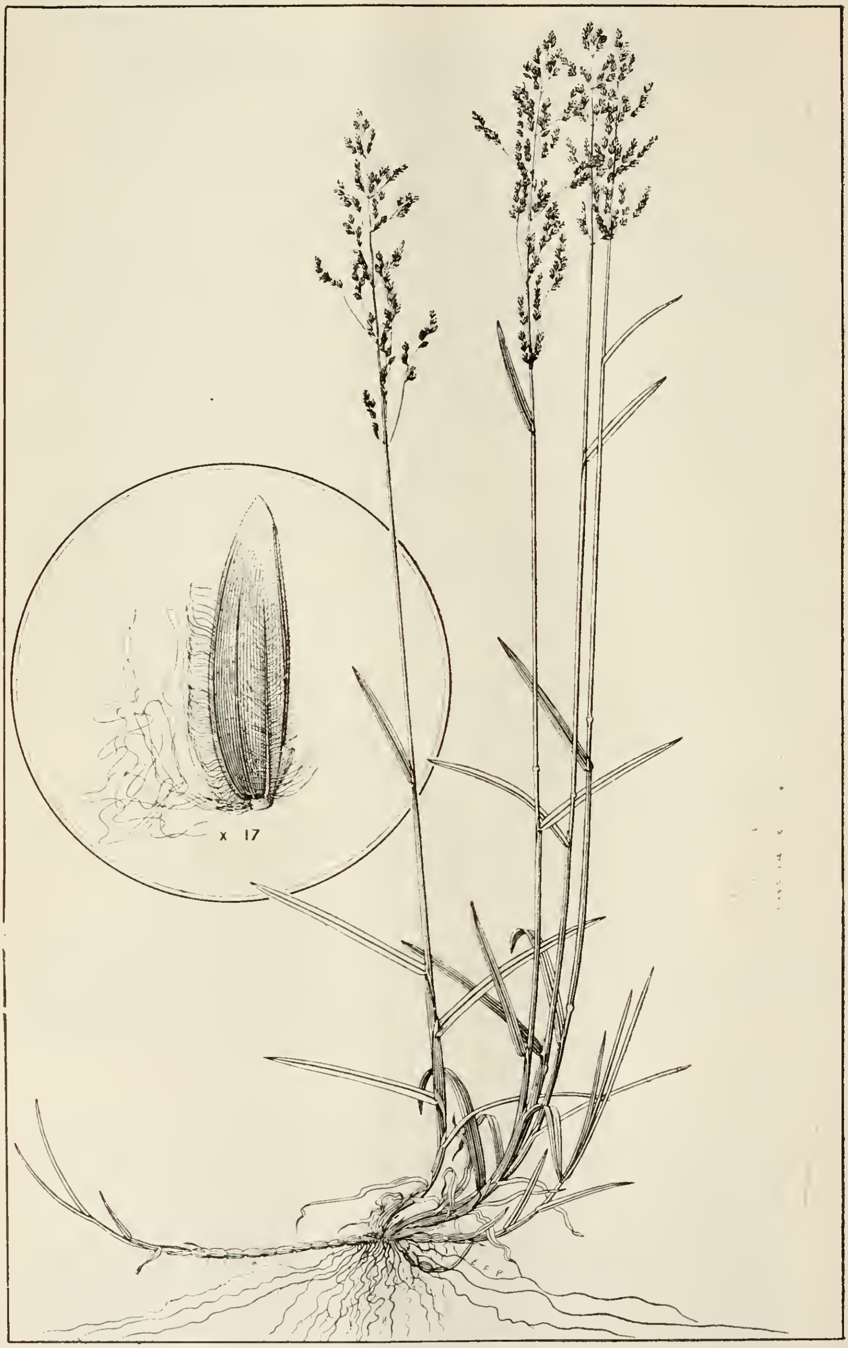

Fig. 1.—Kentucky Blue Grass (*Poa pratensis*).
Note that the grass is smaller in every respect than Texas Blue (Fig. 2). It also sets seed whereas Texas Blue does not.

Popular Descriptions of Grasses.

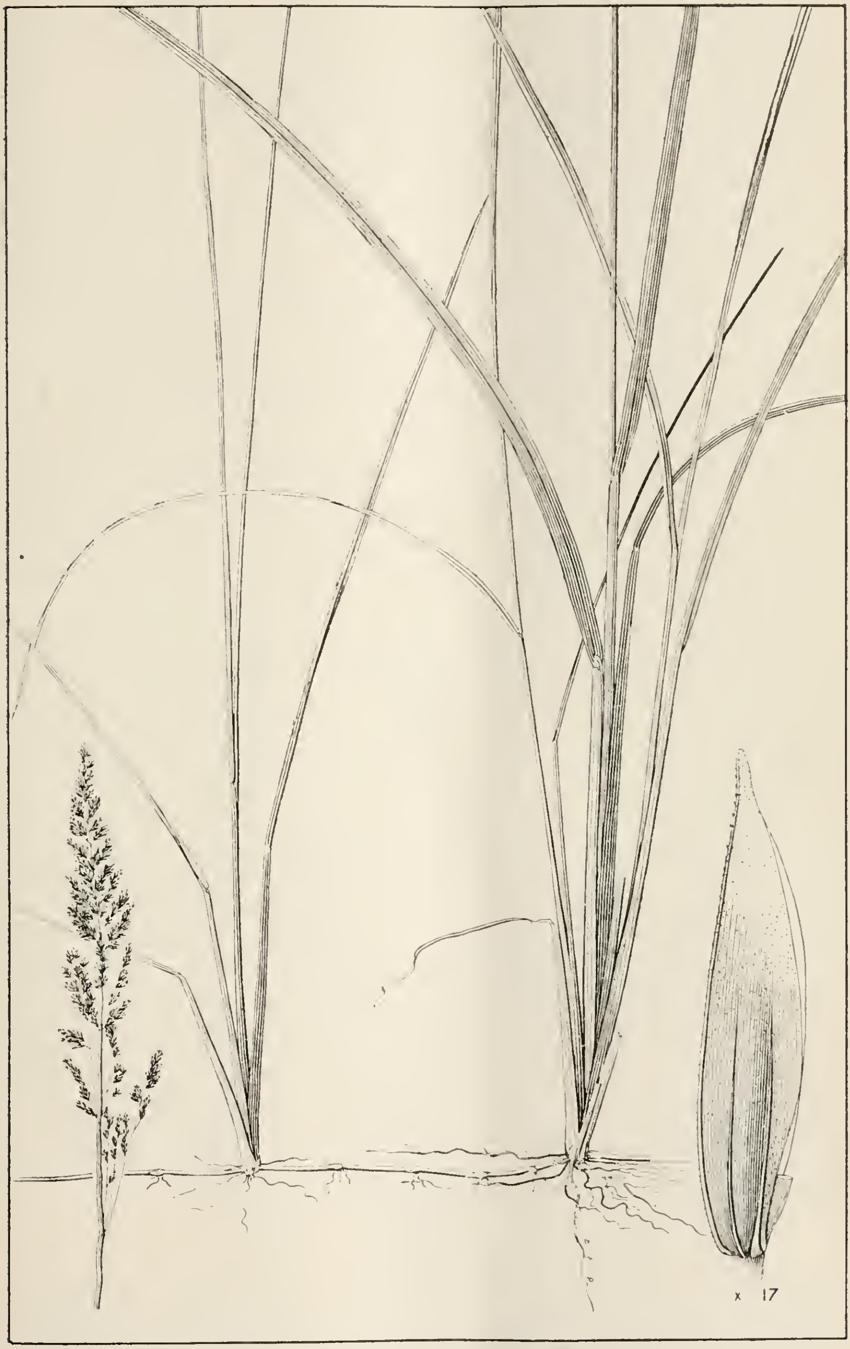

Fig. 2.—Texas Blue Grass (*Poa arachnifera*).
Note that the growth is much larger than Kentucky Blue in all respects. This grass does not set seed.

POPULAR DESCRIPTIONS OF GRASSES.

Kentucky Blue grass will not grow well on poor soils. It is best adapted to soils of limestone formation, but it also grows well on volcanic and alluvial formations. There is, perhaps. more Kentucky Blue grass grown on the basaltic soils of New England than in any other part of the State.

One of the great disadvantages of Kentucky Blue grass is the poor germinating quality of the so-called seed. Owing to the harvesting of the seed crop before the grain is mature, a percentage germination of over 40 per cent. is very rare in commercial seed. As a consequence it is extremely difficult to obtain a quick stand of Kentucky Blue grass. In all cases under observation it has been noticed that where this grass has obtained a good hold in pastures, it has started from a poor stand, and has taken a couple of years to spread by means of its underground creeping root system. Owing to this fact, it has been found advisable to grow it with a strong growing grass as a cover crop.

Phalaris bulbosa, or even Perennial Rye and Red Clover have been found to serve the purpose of cover crops in a very satisfactory manner. In a Farmers' Experiment Plot, established at Mittagong, Kentucky Blue grass, after two years, formed quite a thick undergrowth to the taller *Phalaris bulbosa* in the plot. At Glen Innes Experiment Farm it has spread slowly but surely, and now promises to crowd out the Perennial Rye and Timothy grasses.

Kentucky Blue is most frost-resistant and very sensitive to dry conditions. It takes, however, a considerable amount of drought to kill out the grass, and it quickly responds to rain. On the Northern Tableland it provides feed for practically nine months out of the twelve. It also possesses a desirable characteristic in the fact that the faded or half-dead flag possesses palatable and nutritious qualities.

Kentucky Blue grass behaves peculiarly in that no matter how favourable the conditions may be after cutting, it will send up only one seed stalk in twelve months. For this reason it is an ideal lawn grass for cool districts, and some very fine lawns of it may be seen on the Central Tableland. In establishing a Kentucky Blue grass lawn, however, it is essential that the land be cultivated to a fine tilth and absolutely freed from weeds. A heavy seeding, as much as 60 lb. to the acre, should be applied. If the grass is mixed with Perennial Rye a better opportunity is afforded of choking the weed growth.

In sowing pastures, the seed should be sown early in the autumn or in the middle of spring on the tablelands. This provides the grass with a chance of germinating and growing while the soil is not too cold. Good mixtures should be obtained by mixing 20 lb. of Kentucky Blue grass with 4 lb. of *Phalaris bulbosa*, or 12 lb. of Rye grass and 2 lb. of Red Clover.

TEXAS BLUE GRASS (*Poa arachnifera*).

This is a perennial grass introduced from Texas, U.S.A. It resembles Kentucky Blue in its creeping root system, but has larger leaves, and is, in all respects, a much coarser grass. Its specific name (*P. arachnifera*) is due to the cobwebby hairs at the base of the flowering spikelets.

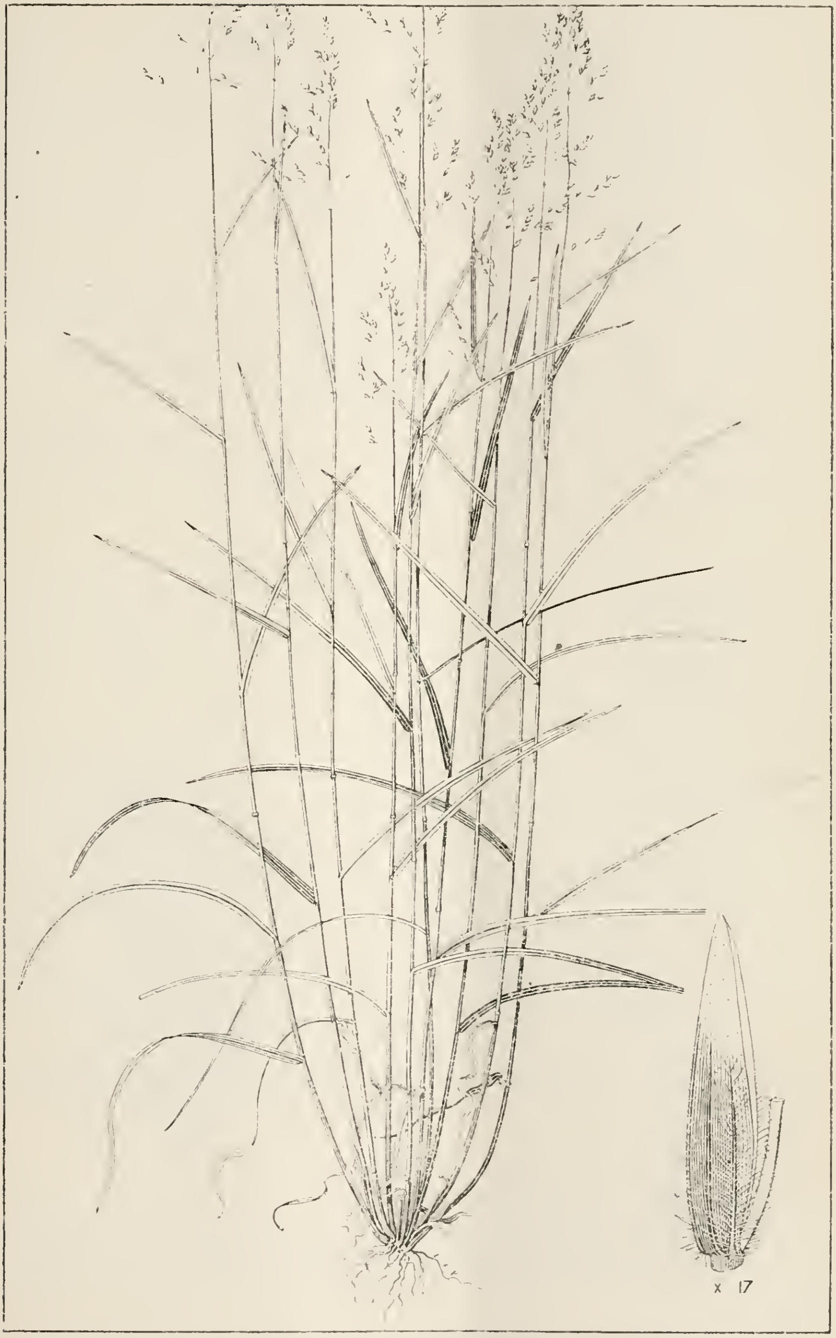

Fig. 3.—Canadian Blue Grass (*Poa compressa*).

This grass somewhat resembles Kentucky Blue. It is, however, more leafy, and does not creep to any extent.

POPULAR DESCRIPTIONS OF GRASSES.

Texas Blue grass is unisexual, *i.e.*, some plants are male (bearing staminate flowers only) and others are female (bearing pistillate flowers only). Owing to this fact the grass does not set seed in any quantity, which is a great drawback to its popularity. An American botanist has been successful in crossing it with Kentucky Blue, but the resulting progeny was as devoid of seed as the Texas Blue parent.

Texas Blue grass, however, is easily propagated by root planting, and it spreads very rapidly.

In districts with a decent rainfall it must be classed as inferior to Kentucky Blue grass, but there is no doubt that it is capable of enduring drought conditions better. This is evidenced by the fact that in the Experiment Farms of the Western districts, such as at Cowra and Wagga, a plot of this grass proved much longer-lived than that of Kentucky Blue.

Some pastoralists plant this grass and allow it to spread, but there is little likelihood of it ever becoming popular. It is more a cattle than sheep grass, and will endure a considerable amount of trampling.

CANADIAN BLUE GRASS (*Poa compressa*).

This grass is a native of Europe and Asia. Although it occurs abundantly in North America, the latest information from that country indicates that there is little doubt it has been introduced thither. In habit it closely resembles Kentucky Blue, but whereas in the latter the colour is a dark green, in Canadian Blue grass it is a distinct bluish green.

Canadian Blue grass is now becoming popular in Canada among ranchmen, who speak highly of it as a fattening grass. In New South Wales it is seldom seen outside the Experiment Farms. At Glen Innes and Bathurst Experiment Farms and at Hawkesbury Agricultural College it has shown much greater drought-resisting properties than Kentucky Blue grass, and there appears little doubt that it will grow on much poorer soils than that grass, as some fine specimens have been received from the hungry soils of Blackheath. The seed also has a much higher germinating capacity. In structure the seed closely resembles that of Kentucky Blue grass, and it is often used in adulterating parcels of seed of the latter. The grass will endure a considerable amount of trampling from stock.

There are elevated districts in this State with soils of a poor quality where Canadian Blue grass should be a valuable acquisition to the pastures.

ROUGH-STALKED MEADOW GRASS (*Poa trivialis*).

This grass is a native of Europe, and is now grown to a small extent in the cooler regions of the globe. It is somewhat similar in the appearance of its foliage to Kentucky Blue grass, but it is characterised by the absence of underground root stocks, and by the roughness of the stalk near the flower.

To do well this grass likes rich moist soils. Even in such situations it is never likely to displace Kentucky Blue grass.

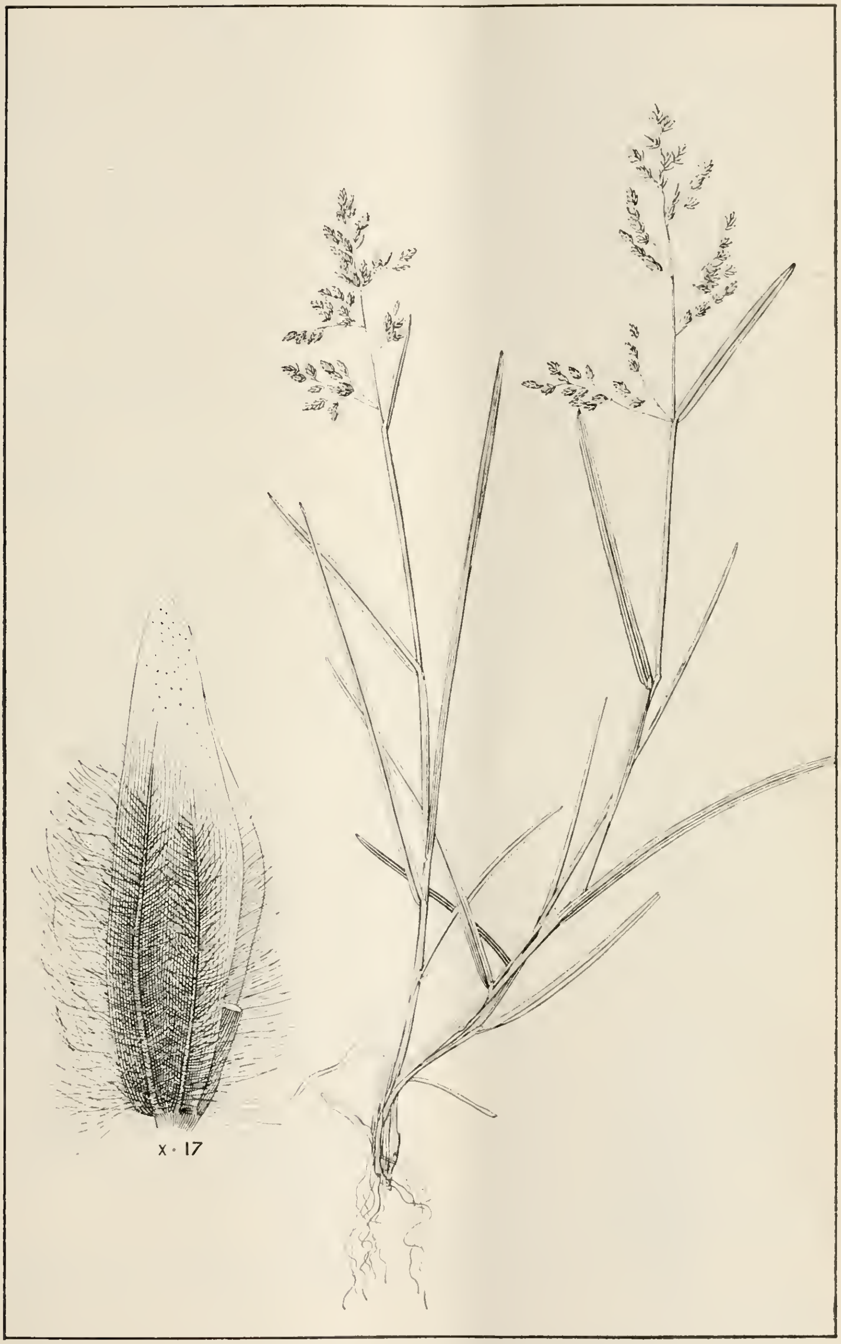

Fig. 4.—Winter Grass or Goose Grass (*Poa annua*).
This grass can be distinguished from most of the other Poas by its soft texture and annual character.

POPULAR DESCRIPTIONS OF GRASSES.

GOOSE GRASS OR WINTER GRASS (*Poa annua*).

This grass is extremely common in the coastal regions of New South Wales, where it invades Couch and Buffalo grass lawns in the autumn, winter and spring months of the year, imparting to the landscape that vivid green appearance so striking to the eye. It is a small tufted grass, growing about 4 to 6 inches high, with a very fine leaf. It improves the appearance of a lawn in the winter months, owing to the detrimental effect of the low temperatures on the principal grass constituents (Couch or Buffalo). Goose grass will stand a considerable amount of cutting, and is a most rapid grower. As soon as the warm weather sets in, however, it quickly sends up its seed head and turns brown, imparting an undesirable appearance to the lawn; for this reason it is advisable to pull up the tufts about September. This allows free action for the root system of the principal grass constituents, and the latter, with the approaching summer heat, soon assume the appearance desirable for a lawn.

Poa annua is a good winter grazing grass where it occurs spontaneously in pastures, and its presence is not unwelcome.

TUSSOCK OR AUSTRALIAN POA (*Poa cæspitosa*).

This is a native grass that is extremely common on the coast and tablelands. It grows in the form of tufts, giving out, as a rule, numerous long wiry leaves. It occurs in all kinds of situations, but reaches its best development on volcanic soils in elevated districts. On the basaltic soils of the New England and Monaro tablelands it dominates the situation in many places. A striking example of the manner in which it replaces the finer coastal grasses is seen in ascending Mount Brown on the Bega-Nimitybelle road. Up to 1,000 or 1,500 feet dominant coastal grasses, such as Paddock Love or Couch grass, are common, but thence these fine grasses become gradually replaced by the Poa. On the Nimitybelle and Monaro plain the Tussock Poa becomes dominant, and presents unsightly tufts in the paddocks, which are seldom touched by the sheep, and provide little nutriment.

This grass has become a weed in cultivated pastures at Glen Innes Experiment Farm, where it has encroached more and more until it has crowded out the finer grasses. Owing to their unpalatable qualities the tufts are allowed by stock to have full sway. Digging out becomes a difficult process if the grass gets a good hold.

Tussock Poa is often replaced in the harder granitic soils by *Danthonia* sp., a very valuable sheep grass. We thus have an example of the better classes of soils being dominated by a useless grass, while on poor soils a most nutritive and valuable grass takes possession.

The area occupied by this grass on the coast and tablelands is a considerable one, and it is extremely unfortunate that its palatable and nutritive qualities are so low.

It is an excellent drought-resistant grass, which is its only redeeming feature.

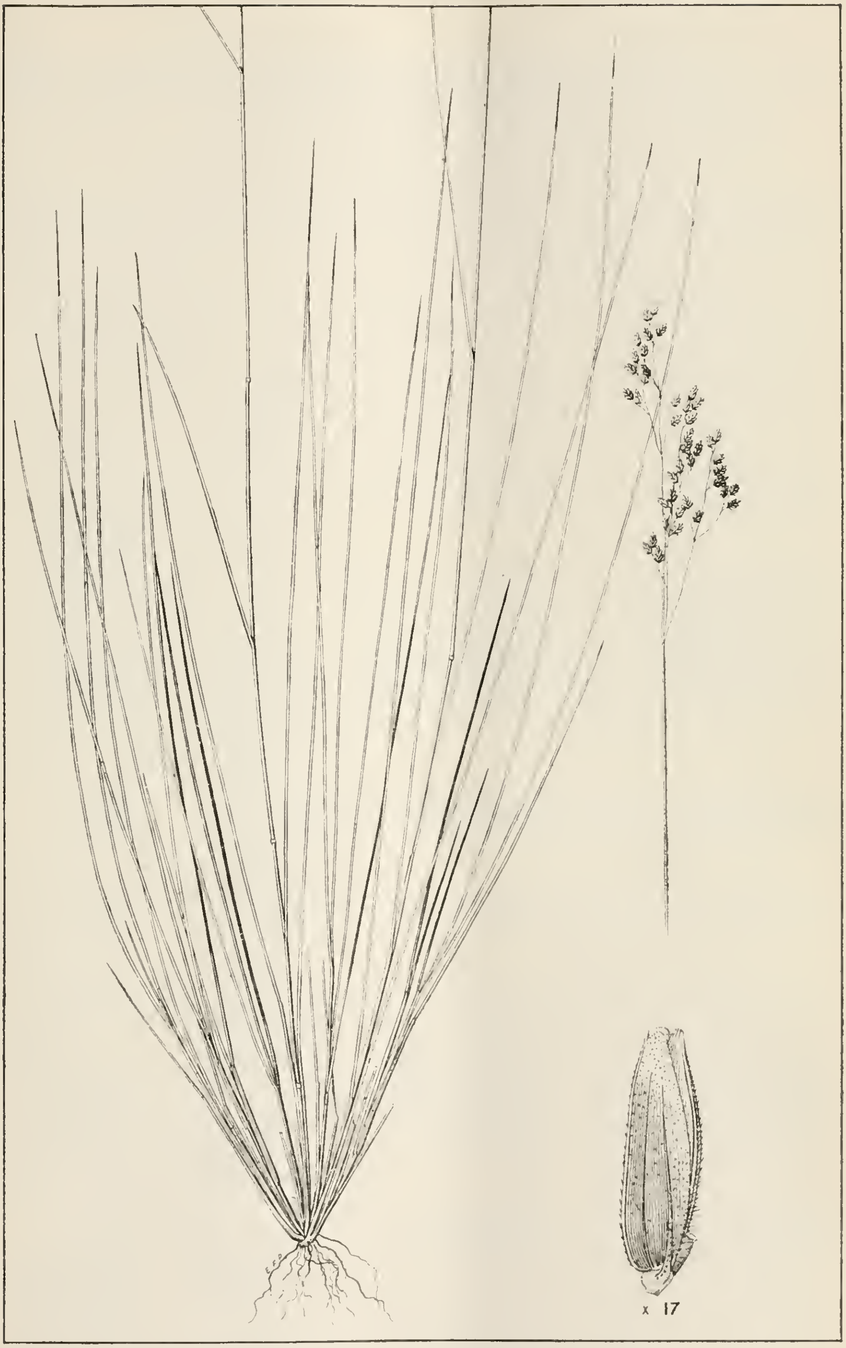

Fig. 5.—Native or Tussocky Poa Grass (*Poa cæspitosa*).
A tall-growing tussocky grass, with long narrow leaves, and usually wiry.

POPULAR DESCRIPTIONS OF GRASSES.

List of Noxious Plants, showing the Names of the Areas in which such Plants have been declared, since 1st July, 1917, to be Noxious.

[Last reference *Agricultural Gazette*, July, 1917, page 485.]

The following list has been supplied by the Local Government Department:—

Noxious Plant.		Areas.	
Scientific Name.	Common Name.	Shires.	Municipalities.
Amsinckia intermedia	Yellow Burr Weed	Coolamon. Mitchell. Culcairn.	....
Argemone mexicana	Prickly Poppy or Mexican Poppy.	Mitchell. Coolamon. Eurobodalla.	Junee. Tamworth.
Carduus lanceolatus	Black Thistle or False Scotch Thistle.	Macleay.	....
Carthamus lanatus	Saffron Thistle	Tumbarumba. Coolamon. Gilgandra.	Blayney. Tamworth. Glen Innes. Wyalong.
Centaurea calcitrapa	Star Thistle or Chinese Burr	Tumbarumba.	Blayney. Wyalong.
Centaurea melitensis	Star Thistle	Cessnock. Coonabarabran.	....
Centaurea solstitialis	St. Barnaby's Thistle	....	Tamworth.
Cryptostemma calendulacea	Cape Weed	Cessnock.	....
Datura Stramonium	False Castor Oil Plant	Cessnock.	Woollahra.
Echium plantagineum	Paterson's Curse	Tumbarumba. Cessnock. Jemalong. Tamarang. Weddin. Bogan. Windouran.	Quirindi. Parkes. Temora.
Emex australis	Cat's Head	Cessnock.	Bega.
Erigeron canadensis	Cobbler's Pegs	....	Ashfield.
Hypericum perforatum	St. John's Wort	Kyeamba. Tumbarumba. Culcairn. Jemalong. Adjungbilly.	Cudgegong.
Inula graveolens	Stinkwort	Kyeamba. Coolamon. Tumbarumba. Jemalong. Adjungbilly. Windouran.	Wallendbeen. Parkes. Wyalong.
Lantana camara	Lantana	Cessnock. Terania. Ku-ring-gai.	Ashfield.
Lycium barbarum	African Box-thorn	Gilgandra.	....
Marrubium vulgare	Horehound	Holbrook.	....
Nicotiana glauca	Tree Tobacco or Tobacco Bush	Weddin.	....
Phytolacca octandra	Red Ink Plant or Dye Berry	Imlay.	Ashfield.
Ricinus communis	Castor Oil Plant	....	Woollahra.
Rosa rubiginosa	Sweet Briar	Tumbarumba. Cessnock.	....
Rubus fruticosus	Blackberry	Tumbarumba. Cessnock. Ku-ring-gai.	Ashfield.
Rumex crispus	Curled Dock	....	Cowra.
Sida rhombifolia	Paddy's Lucerne or Queensland Hemp.	Cessnock.	Ashfield.
Xanthium spinosum	Bathurst Burr	Sutherland. Tumbarumba. Cessnock. Weddin.	Blayney. Wallendbeen. Woollahra. Cudgegong. Wyalong.
Xanthium strumarium	Noogoora Burr	Cessnock. Wingadee. Tarro.	....

Butter Grading.*

L. T. MacInnes, Acting Dairy Expert.

As a means of fixing values and defining qualities, official butter grading has been in use in New South Wales for several years. It was first brought in under the provisions of the Commerce (Trades Descriptions) Act, 1905, and its use was afterwards extended under the New South Wales Dairy Industry Act, 1915. The State of Queensland also has its local Act regulating the grading of dairy produce submitted for sale. The Commerce Act only covers butter submitted for export beyond the Commonwealth; but in New South Wales the Dairy Industry Act controls not only exports overseas, but also the interstate and local trade, including that used for ships' stores.

Under the Commerce Act grading is not made compulsory, but butter may be submitted and graded on a voluntary basis, *i.e.*, if the owner or exporter's agent so desires.

Under the law of this State, and also that of Queensland, grading is made compulsory for all exports. The Commonwealth Act is purely a commercial measure, as its name implies, and is greatly used for facilitating trade. On the other hand, the New South Wales Dairy Industry Act not only deals with the commercial side, but also in a comprehensive manner with the education and instruction of those engaged in the industry, besides the inspection from a sanitary and health point of view of all premises used for the manufacture of dairy produce intended for sale.

The Commercial Aspect of Grading.

Grading can be considered under two heads, viz.,—its commercial aspect, and its educational aspect.

Into the former the Federal Government largely enters in connection with overseas trade; while the latter is considered to be a matter for State control and administration.

Taking commerce first, we find grading to be of the greatest aid in fixing values for butter sales. As an instance of this, we have the contract entered into during the past year with the British Imperial Government for the purchase of the whole of the exportable surplus of Australia to the value of £4,500,000. This contract was based on the grade certificates issued by the Government authorities. If a complete system of grading had not been in use in the butter-producing States of the Commonwealth such a contract could not have been carried out.

The data collected from the information obtainable from the grade certificates enabled this State to prove that the quality of its butter had reached a much higher standard, and that, therefore, we were entitled to a higher price for our produce than we had been getting in previous years.

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[*] Extracts from an Address delivered under the auspices of the Royal Agricultural Society, at the Show Ground, Sydney, on 2nd April, 1918.

Prior to this information being made available, butter from the State of Victoria was valued at 2s. per cwt. more than that manufactured in this State, while the New Zealand article up to twelve months ago was valued in British markets at 8s. per cwt. more.

Danish butter brought considerably higher prices than that of any other country. This year New South Wales' sellers have been on a much better footing, because through grading we have been able to demonstrate clearly that the quality of the butter exported was better than that produced in Victoria, and that the higher grades were on a par with New Zealand.

When the Imperial contract was entered into early last spring, the sale was based on 151s. per cwt. for all butter grading 90 points or over, and 1s. per cwt. less for every point scored under 90. The New South Wales Government was successful in having this altered to provide for 1s. per cwt. to be added on for every point scored over 90, up to and including 95 points, thus bringing our better quality butter practically on the same level as New Zealand. This additional price meant putting some £25,000 into the pockets of the dairy farmer; and for this he has to thank the system of grading which we now have, and the manner in which the information so derived was made use of by the New South Wales authorities. The grading of butter at the place of export also enables the merchant to negotiate forward sales on a quality basis, thus greatly facilitating trade with other countries. This method of selling is more followed in New Zealand, where they have had the grading system in use for many years past. In New South Wales it was the practice prior to the war to consign the export surplus to London to be sold on the factory's account, thus ensuring to the manufacturer all the profits, if any, that might be made on the sale. Grading is also valued in this direction, as it enables the manufacturer to have a better idea of the quality of the butter he is placing in the English market, and further, to have a check on the prices returned by his London agent.

Storage for Winter Supplies.

During the past two years butter has been stored in the months of March and April, when there was a surplus on the market, and this butter was brought out and distributed amongst the grocers during the winter months (July and August), thus enabling the retailer to have a more regular supply all the year round. These storage schemes were only possible because we had a grading system that enabled us to select the highest quality butters, and set them on one side for storage purposes.

The Educational Aspect.

Apart from the use to which grading has been put for commercial purposes, we have also been enabled to make it a means of distributing much information to those interested in the manufacture of dairy produce. Such instructions are sent out to factory managers, and also to the field staff of instructors attached to the Dairy Branch of the Department of Agriculture. When grading a parcel of butter, the expert official who does the work not only allots points to denote the value, but also enters in his notebook remarks covering any defects he may notice in the manufacture or flavour of the box which is examined. Under the Dairy Industry Act each box of butter packed at the factory must bear marks showing the number of the churn or cream vat and the date of manufacture. This enables the sample of each churn or cream vat to be examined and reported on. While the State was carrying out the grading of export butter on behalf of the Commonwealth, we made a practice of entering up these churn marks on our grade advices and of letting the factory know the quality under each mark, and the defects, if any. Since the Commonwealth authorities took over the grading at the end of last year, and have carried it out themselves, they have omitted to give this information to the manufacturer. As factory managers keep a daily record of the butter manufactured, showing the essential details, such as churning temperatures, water temperatures, and acidity of cream, together with any special remarks on the quality of the cream graded at the factory, the information which we were able to give them, showing the quality of each lot of butter churned, was of the utmost value, and the action of the Federal authorities in discontinuing this practice has deprived them of a most important means of instruction. In order to make up for this in part, the State has sent out the fullest information possible on all butter placed on the local market which it has been possible to examine. By being in a position to give the manufacturer the fullest information on the defects noticed in his butter, it has been possible to enable him to effect remedies; and by keeping the instructional staff of the Department in daily touch with the quality of the output of all factories in their respective districts, we have been enabled to give much valuable aid and instruction to factory managers, thereby helping them to improve the quality of their output.

Under the Dairy Industry Act it is provided that all cream delivered to a factory must be graded into at least two qualities, tainted and untainted. The manufacturer has to churn each grade apart, and to pack the butter made under a brand to correspond with the quality of the cream churned. This butter, when it comes on the market, is check-graded by a competent Government grader, and, if the quality on examination is found to be different to the description placed on the box, such trade description is amended to agree with the grade of the butter, and the factory manager and the cream grader concerned are called upon to give an explanation as to why they have contravened the regulations of the Dairy Industry Act. The effects of grading on such strict lines for quality purposes has been to greatly increase the quality of the butter placed on the local and export markets. The importance of correct cream grading cannot be too strongly pressed. It is a basis of the successful manufacture of good quality butter.

The officials who are entrusted with the responsible work of grading butter have been trained to a high pitch of efficiency, as is evidenced by the precision of their gradings. As an example of this, the results of the winter storage butter are very interesting.

In March, 1916, butter was examined by me, and accepted as suitable for long storage purposes. At the time of examination it scored 93 points and over out of a possible 100, that is, it was of choicest quality. After four months' storage at a temperature of 5 degrees Fahr., 85 per cent. was found on being defrozen to be still of choicest quality, worth 93 points and over, while 7 per cent. was a good first grade quality, scoring 91–92 points. Thus 92 per cent. of this butter was suitable for retail grocers' trade. Those butters which the grader at first examination classified as being slightly tainted, and which scored 90 to 92 points, on being regraded in July and August, four months after being first examined, gave 49 per cent. bare first grade, and 51 per cent. second grade and pastry quality, that is, less than half was fit for table use. In the following year, 1917, only butter of choicest quality was accepted in the first instance as suitable for storage. When the time came to release this butter for the use of the retail trade it was found, in spite of the long period during which it had been stored, that the quality was in almost all cases equal to when it was first put into cold storage.

The same accuracy and precision in grading butter is noticeable in the judging at the Royal Agricultural Society's exhibition each year. After giving his decision the judge often meets the manufacturer of the exhibit and goes over the judging with him, and in numerous cases I have known the buttermaker to express astonishment on finding that similar points and remarks had been recorded on butters which he had entered in different classes, and which had come out of the same churn, and were worked and packed under similar conditions. A properly-trained judge who is possessed of a requisite manufacturing knowledge and a good palate and sense of smell, should be able to consistently judge the quality of the butter to within one point or even half a point.

Certain fixed standards for butter grading are used by both the Commonwealth and State Governments, and also by the Royal Agricultural Society. The two former allot the points as follows :—

Flavour and aroma	50	points.
Body, texture, including moisture	30	,,
Condition, salt, colour, &c.	20	,,
Total	100	,,

For show judging purposes the Royal Agricultural Society's standard is :—

Flavour and aroma	65	points.
Body and texture	20	,,
Colour	5	,,
Salting	5	,,
Packing	5	,,
Total	100	,,

To make these standards more easily understandable, the following are definitions of the different characteristics enumerated.

Flavour and aroma for superfine butters should be bright, clean and nutty. For the butter to go within the class designated as "choicest" under the Dairy Industry Act, that is, minimum 43 points, the flavour should be clean, and there should be absolutely no trace of the slightest taint. Butter made from cream that has been neutralised and pasteurised, and to which no artificial starter has been added, may be, and often is, flat both in flavour and aroma. If, however, it is clean to the taste and smell it should still be eligible to be classified as "choicest." Such butters generally improve by keeping, and at the end of several months' cold storage at a low temperature, are found to be of a quality equal to when they were first put in; in fact, in many cases, through the action of lactic bacteria, the flavour and aroma is much improved.

Body and texture should be firm, and the butter should break clean, showing a close granular conformation which should not melt easily when placed in the mouth, while weak-body butters dissolve almost immediately when put to such a test and will not resist high temperatures. Moisture should be well incorporated and show no trace of cloudiness, which is occasioned by the buttermilk not being completely washed out. Free moisture is a defect; by "free moisture" is meant the water showing in large beads or drops. Butters which are loose and spongy in texture are heavily penalised when being judged.

Colour: a light straw with an absence of streaks or mottles is desirable. The butter should be uniform in colour, and the surface should not be bleached, wholly or in part.

Salting: to suit the requirements of the Sydney market, butter should be lightly salted; the salt should be well mixed throughout the mass of the butter.

Packing and general appearance: The finish of the surface of the butter should be neat and pleasing to the eye; the imprint of the brand and honeycomb finish should be clear and distinct; the edges should be neat and clean, Greasiness both in appearance and in texture is a bad fault. Heated and bleached surfaces are also penalised. The packing should be done so that the butter is well pressed into the package, and no air spaces or cavities left

The package itself should be clean and neat in appearance, and if branded the brand should be put on in a clear, distinct, and indelible manner. A dirty package or a blotched brand should not be used. The inside of the box should be lined with good clean parchment paper, and a loose square sheet of parchment should be placed on the surface of the butter. Mould growths on the surface of the butter, on the covering papers, or on the inside of the box itself should be guarded against. The boxes should be of sound seasoned timber, of a quality that will not give off a taint or smell which will affect the butter. Second hand boxes should not be used.

Grades under the Commonwealth Commerce (Trades Description) Act, 1905.

Under this Act butter which is graded for export beyond the Commonwealth is classified into five divisions as follows:—

Maximum Points	100
Superfine Pure Creamery Butter ...	95 points and over.
First Grade Pure Creamery Butter ...	90 to 94 points.
Second Grade Pure Creamery Butter...	85 ,, 89 ,,
Third Grade Pure Butter	80 ,, 84 ,,
Pastry Pure Butter, under	80 points.

Under the New South Wales Dairy Industry Act the classifications are:—

Choicest Pure Creamery Butter ...	93 points and over.
First Grade Pure Creamery Butter ...	90 to 92 points.
Second Grade Pure Creamery Butter...	85 ,, 89 ,,
Third Grade Pure Butter	80 ,, 84 ,,
Pastry Pure Butter, under	80 points.

Here choicest butter should be clean and untainted. First grade butters are those affected by food, slight biological or chemical taints, or by a combination of them. Second and third grades and pastry butters are more or less badly tainted, but not to such an extent that they have become putrescent or unfit for human consumption. Practically speaking, third grades are only used for pastry purposes; in fact, in this State the public taste has been so educated that, unless driven to extremities by a scarcity of butter, only choicest quality is demanded. First grade is taken on sufferance, and other grades are refused for table use.

Grading in relation to Show Judging.

Up to ten years ago butter was judged in Sydney and elsewhere on a system which did not allow of the fullest use being made of the opportunities presented for educational purposes. About that time Mr. G. S. Stening, who was then in the service of the Department of Agriculture as an official butter grader in Sydney, was appointed judge in the butter classes at the Royal Agricultural Society's show. He introduced the system under which we graded and examined butter for the export trade. The scores of each butter were put down under their different headings, and notes were made of any defects in flavour, aroma, or manufacture. Score cards were placed on each exhibit, showing for the benefit of the public and the exhibitors the total points scored by each box, as well as those allotted by the judge under different headings of flavour, &c., body, &c., colour, salting, packing, &c. This enabled all interested to know exactly where certain butters scored high and where they were deficient. Further information the judge was enabled to impart on application, by referring to his grade notes; and by taking exhibitors and buttermakers over the butter it was possible to demonstrate to them where faults had been made, to point out how these faults had occurred and how they could be remedied; and to give point to the lesson they could be shown the boxes that had scored the highest, in order that they might make a comparison. This system has been carried on to the present day, and it is on this basis that all the butter which is staged for this show has been judged.

In judging for show purposes, greater accuracy is demanded than is necessary for grading. In show judging the adjudicator often has to give his decision to the fraction of a point—in fact, butter exhibited at this exhibition for the last two years has been so uniform in quality that the first, second, and third prize winners were selected in each class from some fourteen or sixteen boxes, each of which scored a minimum of 94 points; and when it is mentioned that the maximum points allotted to the winner was not above 96, it will be seen what a difficult task the judge has had and what a small margin there was between the butters submitted. Any butter that received an award of 94 points, or even 93½ points, might be considered in the honor list. To further the educational value of the judging this year, I have arranged to send out to each exhibitor full particulars of the grading of each box of butter submitted in all classes judged by me. In addition to giving the scores, I am including notes on each box of butter examined, wherein are pointed out the defects for which points were lost. I intend to suggest to the manufacturer the causes of such defects, and the remedies that may be successfully applied to combat them. It is hoped by this means that buttermakers will be able to prevent a recurrence of these faults, and that next year the quality of the butter exhibited at this show will mark a further great improvement over that of last year's. To exemplify the improvement that has already taken place in the past two years, the following comparisons are interesting.

In 1917 I judged 230 exhibits in the different classes; this year the number of exhibits staged increased to 331, the quality of which may be compared as follows:—

Grade.	Quality.	
	1917.	1918.
Choicest	62 per cent.	84 per cent.
First	33 ,,	15 ,,
Second	5 ,,	1 ,,

From this it will be seen that, taking the whole of the exhibits in both years, the choicest or highest grade had increased this year by 22 per cent. and the lower grades had correspondingly diminished. Second grade butters were practically non-existent this year. These figures are taken from the scores allotted to the classes for butter for export and for local consumption, and include the "continuous grading class," the final judging for which was carried out on the show ground.

Continuous Grading Competition.

This is rightly looked upon by manufacturers and by those engaged in the butter trade generally as the blue ribbon of the butter section. This year the class was judged on different lines to those adopted previously, when it was the custom for an official of the Royal Agricultural Society to collect once a month on the wholesale butter floors of Sussex-street two boxes of butter taken from one of the ordinary consignments placed on the local market by a contesting factory. These boxes were taken to a central depôt, and were further graded by a Government official trained to such work. This was carried on for seven months prior to the four weeks before the show was held. For the last month two boxes were collected and placed in cold storage and subsequently taken to the show ground, where they were defrozen and judged in the pavilion. The scores for the whole period of eight months were then totalled, and those scoring the highest aggregate became the winners.

This year these conditions were altered and were made more exacting. Instead of taking two boxes a month from the floors in Sussex-street, the records were taken from the highest and lowest export grade certificates obtained by each brand entered for the competition during the export season, which ranged from November, 1917, to March, 1918, inclusive. It was further stipulated that boxes would only be taken from consignments of twenty-five boxes and over of one grade. In many cases individual consignments amounted to several hundreds of boxes; and as the Government grader examined a sample box manufactured from each vat of cream, it will be seen that the grading was done more effectively than in the past. As already pointed out in this lecture, each factory is compelled to mark every box of butter placed on the market with the date of each day's manufacture and the number of the churn or vat of cream from which it came. During the month of March two boxes of each brand taken from a consignment submitted for export were placed in cold storage for a month, and were then taken to the show ground, defrozen, and judged as in previous years in the pavilion. In allotting points this year, the conditions were also made different to those of previous contests. As pointed out, prior to the contest just completed, the total points of each brand were taken, and those that scored the highest aggregate won first, second, or third prize, as the case might be. This year, however, points were allotted for consistency in quality as follows:—

(1) For each point gained over 93 points, one point to be added.

(2) For each point scored under 93 points, two points to be deducted, with an extra five points deduction where butter fell below 90 points (that is, from low first grade into the tainted class).

The prizes were awarded to the exhibitors which gained the highest aggregate points extending over the whole period, after consistency points had been taken into account.

A comparison of the quality judged in this competition reveals that this year the average quality of the butter staged in the pavilion for judging after a month's storage and after being defrozen, shows a marked improvement over that staged at the 1917 exhibition. In making these comparisons it must not be forgotten that in 1917, as in previous years, the period covered by the competition was seven months, including that period of the early spring when the cooler weather prevails, whilst this year the period was limited to the five worst manufacturing months of the year. In spite of the more stringent conditions under which this class was judged this year, the number of consignments reaching "choicest" standard shows an increase of 12 per cent. over the results of the 1917 competition, the figures being:—

1917 ...	...	63 per cent. choicest.
1918 ...	...	75 „ „

This shows a most satisfactory state of affairs. Factory managers and cream suppliers are to be congratulated on the improvement evidenced by the figures. When the export season was commencing last spring, the Department of Agriculture sent out a strong appeal to all manufacturers of butter and it is very gratifying to see the response that has been made to this and other efforts made by the Dairy Branch of the Department to improve the quality of the butter that is being put on the local export market. As regards the latter, seeing that we have contracted to sell the whole of our surplus to the Imperial Government, it is indeed a patriotic duty that we give them the best quality it is possible to make. There is all the more reason for this because, on account of the shortage of shipping suitable for the carriage of dairy produce, butter may be kept many months before it reaches the hands of the consumer in Great Britain. In addition, I would impress upon all those engaged in the dairying industry, the great necessity for quality. Not only do we owe it to the British Government to give them as much butter and cheese as we are in a position to produce, but we should make every effort to supply nothing under choicest quality.

PURE SEED MAIZE—CO-OPERATION BY FARMERS.

OWING to the value of acclimatised seed maize, and the danger of its becoming impure in cross-fertilisation, it has been the policy of the Department, in order to ensure pure seed being available to farmers, to have only one variety grown at each Experiment Farm, where it undergoes systematic improvement for yield and quality.

As these Experiment Farms are not representative of every large maize-growing district in the State, the principle has been extended to include other districts, where this improvement system has been undertaken, under Departmental supervision, by the co-operation of reliable farmers in these districts.

In order to further extend this work and to cater for other important maize-growing centres, the Department would be glad to hear from farmers who are already specialising in, or who are willing to specialise in, the production of pure seed maize by co-operation with the Department.

The object of this is to get one or more reliable farmers in each district where there is no Experiment Farm to grow pure seed maize of a variety which is suited to the district, so that he can supply pure seed of good quality to farmers in that or any other district who may require it.

As varieties of maize cross-fertilise very readily, this would entail the growing of one variety only, or ensuring that this variety is not crossed by others, so that it may be kept pure.

A special seed plot, about an acre in area, planted with the best selected ears of the variety would be required, and where possible this plot could be utilised as an ear-to-row test or experiment to determine the best yielding types of ears of the variety. At the same time the variety would be improved in yield and quality.

Tests have shown that the yield of a variety has been increased by ten bushels per acre by this system.

All communications should be addressed to the Under Secretary and Director, Department of Agriculture, Sydney.

Oat Variety Trial, Yanco.

J. M. PITT, Experimentalist.

[The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot be drawn from these trials, as they have only been conducted for a year. Later, when results for, say, five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.]

IN order to compare some of the new varieties of oats with those already in common use for hay, an experiment was conducted at the Yanco Experiment Farm in the winter of 1917.

Algerian, a variety which had given every satisfaction previously, both for hay and grain, and whether sown early or late, was used as the check variety, and in addition to holding its own in the earlier sowing, easily gave the best results in the later seeding.

The season throughout was exceptionally wet, interfering considerably with the harvesting operations. Some of the earlier maturing varieties were past their best before a possible chance to harvest them could be obtained.

The following tables give the results. Guyra seed arrived too late for the early sowing.

RESULTS of Oat Variety Trial, Yanco Experiment Farm.
Earlier Sowing, 16th May, 1917.

No.	Variety.	Yield per Plot.	Yield per acre.				Percentage Yield
		lb.	t.	c.	q	lb.	
1	Algerian (*check*) ..	560	2	10	0	0	100·
2	Ruakura	520	2	6	1	20	100·5
3	Sunrise	505	2	5	0	10	106·5
4	Lachlan	448	2	0	0	0	103·9
5	Algerian (*check*) ...	388	1	14	2	16	100·

Later Sowing, 5th June, 1917.

No.	Variety.	Yield per Plot.	Yield per acre.				Percentage Yield.
		lb.	t.	c.	q.	lb.	
1	Algerian (*check*) ...	327	1	15	0	4	100·
2	Ruakura	285	1	10	2	4	83·7
3	Guyra	330	1	15	0	8	94·0
4	Algerian (*check*) ...	363	1	18	3	16	100·
5	Sunrise	262	1	8	0	8	68·3
6	Lachlan	364	1	19	0	0	90·7
7	Algerian (*check*) ...	420	2	4	3	8	100·

Notes on Varieties.

Algerian.—This stooled thickly, and the straw was very fine. It grew to about 3½ feet high, and carried a large amount of foliage. It took the longest time to mature. Has given good results at the Farm for a number of years.

Ruakura.—This is much earlier than Algerian. It did not stool quite so well, but grew to 4 feet. The early growth was more upright. It is stouter in the stalk, and has not quite so much leaf as Algerian.

Sunrise.—This is also early. It grew very rapidly, reaching over 5 feet in height. It stools poorly. The straw is coarse, and the leaves broad. It has given good results for an early maturing variety for a number of years now.

Guyra.—This is one of the newer introductions. It is slightly earlier than Algerian. The straw is fairly stout, and the stooling rather poor. It grew to about 4 feet. The foliage is of a bluish-green colour, and the leaves, though not quite as plentiful as those of the Algerian variety, are much broader. The results justify further trials.

Lachlan.—This is another variety of recent introduction. Resembles Guyra, but the straw is stouter. The foliage is also of a bluish-green colour and broad. It grew to about 4 feet, and stooled sparsely.

In spite of the adverse weather conditions, the results can be classed as satisfactory. Rust and lodging were entirely absent. The trials will be continued.

THE INBREEDING OF DAIRY CATTLE.

A CORRESPONDENT asks the following questions :—

> How far is inbreeding in cattle safe? A young bull (Durham) served heifers by the same bull as himself; the calves look all right. (*a*) Could he be used safely on them, or should he be discarded? (*b*) Could a bull be selected out of these calves and mated with heifers of the same calves?

In reply, the Herdmaster, Mr. J. A. Robertson, M.R C.V.S., stated :—

> The safety of inbreeding depends upon the following :—(1) Only male and female stock exhibiting desired characters in excess of any weaknesses should be so mated; (2) the ability of the breeder to judge constitution and to note any other defect or weakness. Upon this devolves the success or failure of the venture—inbreeding is a personal equation. This is important.
>
> With regard to query (*a*) the bull could be used on his heifers, provided the calves *are* all right (not merely *look* all right). As regards (*b*), a bull could be so selected and mated with the heifers of the same drop. This is line-breeding, but the selected calf must have all the points of a successful sire.

Powdery Mildew of the Apple.

EXPERIMENTS WITH IRON SULPHIDE AND OTHER SPRAYS FOR ITS CONTROL.

W. J. ALLEN and W. LE GAY BRERETON.

As powdery mildew of the apple has been prevalent in this State for some years, extensive experiments have been carried out at the Glen Innes Experiment Orchard with Bordeaux mixture and lime-sulphur for its control. The results, however, have not been satisfactory, except on one occasion in a small experiment with Bordeaux mixture.

The lime-sulphur and Bordeaux mixture tests were carried out in a bed of Cleopatra of 124 trees and a bed of Rome Beauties of ninety-three trees. However, after the first year of the experiment, Rome Beauty proving unsuitable for the district, all but twelve trees were worked over to other varieties. The experiment was continued on the Cleopatra, both with lime-sulphur and Bordeaux mixture, and nine of the remaining trees of Rome Beauty received applications of Bordeaux mixture and three trees received no fungicide. At no time during the season could any decided improvement be noticed in respect of mildew in the various plots of Cleopatras sprayed with either Bordeaux or lime-sulphur over the unsprayed check plots, but the nine Rome Beauty trees sprayed with Bordeaux mixture were very free from mildew, whereas towards the end of the season the three unsprayed Rome Beauties had lost fully half their foliage, and the remaining leaves were badly mildewed. The difference was most marked, even in just glancing down the row, and was often noted by strangers who were not aware that experiments were being carried out, and had, therefore, quite an unbiassed mind. However, though the experiment was repeated, such a result was never obtained again.

In comparing pruned and unpruned trees of the same variety, it had, however, been noted that mildew was always worse in trees that had been left untopped in the winter; and in these and later experiments for the control of mildew all trees, both those which were sprayed and those left unsprayed as checks, had all mildewed terminal eyes and wood removed, and, as far as practicable, burnt at pruning.

The Use of Iron Sulphide.

In December, 1914, arrangements were made to test iron sulphide, which was reported to have given excellent results in the United States of America. Though it was recognised that it was then too late in the season to give this spray a fair trial, it was thought advisable to ascertain whether there were any difficulties in mixing, or whether it would scorch or damage the trees in any way. The details received from America were not quite clear as to the method of diluting the iron sulphide, and in the test some trees were sprayed with the black precipitate diluted with 1 gallon to 10 of water, and the others with the stock mixture brought up to the 50-gallon mark after the last racking, and this was stirred and used at the rate of 1 gallon to 10 gallons of water, which was found later to be the correct method. This spray was found quite simple and practicable to make, and though applied at far greater strength than required—in the case of 1 gallon of the precipitate to 10 gallons of water—no injury was done to the trees or fruit; though, when diluted to either strength, the spots of spray on the fruit checked the colouring just beneath them, and even at picking time those parts showed a slightly lighter red, giving a somewhat mottled appearance. This, however, did not detract from the appearance of the fruit. But, as was expected, the first application being made too late, no difference could be detected between the sprayed and unsprayed trees as far as mildew was concerned.

Information received from abroad in reference to the use of iron sulphide for the control of mildew indicated that the first application should be made with the first or calyx application of lead arsenate for moth, but from previous field observations it was suspected that, at any rate under Glen Innes conditions, an earlier application would be necessary.

In 1915 it was therefore decided to divide the experiments into two, in one set making the first application when the blossom buds were showing colour, but while the petals were still folded tight, *i.e.*, the pinking stage, followed by applications combined with each of the regulation lead arsenate sprays for moth, making a total of four applications; in the other set, making the first application combined with the first or calyx spray of lead arsenate for moth, followed by combining it with the two later lead arsenate sprays for moth, making a total of three applications. In addition to iron sulphide, potassium sulphide, which was reported to have given satisfactory results as a fungicide on some plants, was employed in both sets of experiments. The latter was used at the rate of 1 oz. to 3 gallons of water.

As a result no definite improvement could be noticed in any of the sprayed trees over the unsprayed check trees, but the removal of any wood and terminal eyes affected by mildew again gave beneficial results.

In experiments with other sprays for control of other diseases, the Department had previously found that sometimes definite results could not be noticed in the first season, but when persevered with the sprays were successful in later trials, the reason, probably, being that the fungus is gradually weakened and infection lessened. It was therefore decided to continue the experiment in 1916 on the same trees. The same sprays were used as in 1915, and, in addition, atomic sulphur, a proprietary preparation, was tried.

Iron sulphide showed a definite result in the control of mildew, when the first application was made when the blossom buds were showing pink.

However, the orchardist who conducted the experiment pointed out that this test could hardly be compared with those that received the first application only with the first or calyx spray of lead arsenate, as at the pinking period dry weather prevailed, whereas during the calyx period the weather was very wet. It should also be noted, in justice to atomic sulphur, that owing to that spray having not been used before in this experiment, it was on a fresh lot of trees, whereas the iron sulphide was on trees that had the benefit of the previous season's spraying with that mixture.

The experiment was repeated in 1917 on the same lines. On this occasion iron sulphide gave a definite and the best result, while atomic sulphur was almost as good. In both cases the results were definitely better when the first application was made at the pinking stage than when the first application was delayed till the calyx or first application of lead arsenate. The potassium sulphide gave no noticeable control of mildew, and burnt the foliage severely. It was used at the same strength (1 oz. to 3 gallons of water) in the previous two seasons without showing any damage to foliage. This erratic behaviour of sprays is liable to occur; lime-sulphur as a summer spray on apples (especially when combined with some brands of arsenate of lead) was a marked case in point during the past season. Varying climatic conditions have a distinct effect on the use of sprays, and it is only after trials over a number of seasons that conclusions can be drawn.

Summary.

It is proposed to continue the experiments for the control of powdery mildew of apples, but from our experience to date we can make the following recommendations:—

First.—All mildewed terminal eyes or affected wood should be removed, and, as far as practicable, burnt at the time of winter pruning. This is most important, and must be rigidly carried out to obtain success.

Second.—Spray with iron sulphide. The first application should be made when the blossom buds are showing pink, but while the petals are still folded quite tight. The second application may be combined with the first or calyx spray of lead arsenate for codlin month. The third application should be made about three weeks later, combined with a second lead arsenate spray; while the fourth application can be combined with the third lead arsenate spray.

This treatment may have to be followed for more than one season before a definite result can be noticed, nor can it be claimed that it has attained an absolute control of mildew throughout the season. Mildew can be found on the sprayed trees, but it is almost entirely confined to the terminal buds, and to a less extent than unsprayed trees; moreover, the foliage of the sprayed trees is of a far greener and healthier appearance than that of the unsprayed check trees. For the past three seasons iron sulphide has been combined with both lead arsenate for codlin moth and tobacco wash for woolly aphis. The advantage of being able to combine these three specifics is obvious.

How to Prepare Iron Sulphide.

Previous to 1917 the iron sulphide for these experiments was prepared according to the Volck-Ballard method as follows:—

Fill a 50-gallon barrel about two-thirds full of water. Weigh out 10 lb. of iron sulphate (copperas), place in a sack and suspend in the water.

The iron sulphate will dissolve fairly rapidly, and when it is all in solution measure out carefully 2¼ gallons of commercial lime-sulphur solution, testing 33 degrees Baumé, or 2 gallons and 3 pints of a lime-sulphur solution testing 32 degrees Baumé. Slowly pour all but 2 pints of the lime-sulphur into the iron sulphate solution in the barrel, at the same time stirring the mixture vigorously with a hoe or a shovel.

The addition of the lime-sulphur will produce a bulky black precipitate, and when all but 2 pints of the lime-sulphur solution has been added the mixture should be allowed to stand for a few minutes, when the black precipitate will begin to settle, and a little of the clear liquid at the top can be carefully dipped out with a clean glass.

This clear liquid will probably show no yellow lime-sulphur colour, which means that an excess of lime-sulphur solution has not yet been added. About half the remaining 2 pints should now be poured in, and the contents of the barrel stirred vigorously and allowed to stand. Again some of the clear liquid should be dipped off and tested by adding a drop or two of the lime-sulphur solution. If no black precipitate is formed, but instead a pale yellowish tint is obtained, the chemical action is complete for the purpose. Then the barrel should be filled with the water, the contents stirred vigorously, and allowed to stand.

The black iron sulphide will settle near the bottom of the barrel. The clear liquid should be syphoned from this, more water added, the contents of the barrel stirred and allowed to settle, the clear liquid syphoned off again, and this operation repeated until the water poured off shows no yellow lime-sulphur tinge. Three washings should bring about this result; then add water up to the 50-gallon mark; stir. The result is the stock solution of iron sulphide.

As this is an American formula, the gallon is American, which is five-sixths that of an imperial gallon. As all the measurements are by volume, except the iron sulphate, the same strength can be obtained by using 12 lb. ferrous sulphate instead of 10 lb., as in the American formula.

Use as follows:—

Stock iron sulphide mixture, 20 gallons.
Arsenicals and nicotine, as required.
Water to make 200 gallons.

That it can be used stronger was shown in the preliminary tests of 1914.

For the latter applications of this spray in 1917, the modified Ballard method was used, as it is applicable where the water necessary in the previous method is difficult to obtain. In this modification the three washings are eliminated. In this case the same proportions of iron sulphate are used, but the excess of lime-sulphur used when converting iron sulphate to sulphide is not extracted. This method has been found satisfactory, provided care is taken, firstly, that all the iron sulphate is converted, using the test as in the former method; secondly, provided that the excess of lime-sulphur used in converting the iron sulphate is only slight. This can be assured if, after the bulk of the iron sulphate is converted, lime-sulphur is added only a half or quarter pint at a time, till the test shows that the conversion is complete. Lime-sulphur of lower density than 32 degrees B. can be used, only, of course, a greater quantity is required to convert the iron sulphate.

Eradication of Blackberry.

C. W. BURROWS, Field Assistant.

BLACKBERRY vines are most difficult to eradicate, especially as merely cutting down occasionally tends to strengthen the root growth, and ultimately to increase the trouble.

Where the pest is confined to a small area, intended for constant cultivation, trenching to a depth of 18 inches to 2 feet, and removing all growth to that depth, is the surest way, though laborious. Every part—roots, butts, and vines—should be burnt.

The treatment recommended by the Department is the caustic soda method. This chemical, of a strength of 1 lb. caustic soda to 2 gallons of water, has the advantage of being much less dangerous to animal life than arsenical solutions. It is best applied as follows:—

On small areas, first cut the vines down close to the ground, and remove them from the area for burning later. Then, from a watering can, with the rose attached, give the surface from which the vines have been cut a thorough soaking of the above solution. The area is then left until a new growth springs up, and has grown to 4 to 5 inches high. It is not necessary to cut this growth down, but it is advisable to give it a further soaking of the solution, which will soon kill more of the tops and root, but, perhaps, still will not kill the lot. This process will need to be repeated, so as to keep the leaf growth in check, for it is only by keeping the tops down that the roots can be ultimately killed.

On larger areas it will be best to use a mounted spray pump outfit, using an Edgell release valve to regulate the flow of spray.

A solution of arsenite of soda acts in a similar way, but owing to its highly poisonous nature, and the danger from children picking the fruit, it is not recommended.

A flock of sheep or goats kept on an infested area for a few months helps greatly in eradicating this pest. It is best to tether the goats, and to move them about as soon as they have nibbled off all the green shoots.

Rabbit Destruction.*

T. P. GLENNAN, Rabbit Inspector, Moree.

Introduction.

HAVING had an experience of sixteen years in rabbit destruction, my views and conclusions may be helpful to landowners whose holdings are, or likely to be, infested with rabbits.

Subsequent to the disastrous drought of the year 1902, I engaged as a boundary-rider and general station hand with the late Hon. G. H. Greene, M.L.A., owner of the well-known Iandra Station, near Grenfell, and for a period of four years served in almost every capacity incidental to station life. It was here that I got a thorough grounding in the work of rabbit destruction, and a practical knowledge of the various methods used.

Iandra was, at the time stated, an area of about 32,000 acres, enclosed and subdivided by good netting fences, and, despite the fact of considerable clearing and cultivation, there was a large area badly rabbit-infested.

Poisoning with phosphorus and pollard, and fumigating with the compositions then known, were constantly in use, but these methods only served as a temporary relief.

It was therefore decided upon to make a clean sweep of the pest, and to do this the work of total destruction of harbour was begun. All hollow timber, trees and logs, were burned, and all burrows completely dug out. The netting fences were frequently ridden, and their upkeep was made a matter of the most vital importance.

Pit-traps along the boundary, at a distance of half a mile apart, accounted for most of the rabbits that got in from the adjoining holdings whenever a break occurred in the netting, or gates were left open, or by a sudden washaway in the many watercourses usual to undulating country.

Having destroyed all harbour, the importance of keeping the pest under was never lost sight of, and whenever a rabbit, or even a trace of one, was reported, the early capture of the invader became a matter of the greatest concern.

It may be stated, as showing how prolific the rabbit is, that, whenever they escaped capture for a month or two—and this usually happened in large wheat paddocks—the does invariably were full-bellied, and had an extra large litter of young, frequently as many as ten kittens being noted.

This emphasises the necessity for getting rid of all rabbits, and not being content, as many landowners are, with the "thinning-out" process.

Leaving Iandra in 1906, I, in June of the same year, found engagement as a "rabbit overseer" on the S.A.I. Company's Deepwater Station, near Wagga. Rabbits there had a good footing, and the work of destruction was entrusted to me. Poisoning had been the means relied upon, and the whole of a valuable river frontage (some 40 miles long) presented a very badly infested condition.

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* A Paper read at the First Convention of P. P. Board Officials, Sydney, March, 1918.

I almost despaired of doing much good, as the total destruction of harbour was considered too costly, and where sandhills existed was practically impossible. The only way out of the difficulty was by judicious and systematic poisoning and fumigation.

It was found that past failures were due mostly to careless and insufficient work. All too frequently I find this to be the cause of many failures; and the necessity for liberal treatment when poisoning cannot be urged too strongly, working the paddock with due regard for the rabbits when scattered harbour exists.

A thorough and systematic poisoning of the river frontage, working the poison-carts closely and carefully over the many bends and places (which had been previously considered a practical impossibility), gave splendid results.

A number of sandhills, very much burrowed, and, of course, badly infested, were soon found to require special treatment, and as these constituted the main breeding grounds, it was considered expedient to enclose them with wire-netting. This being done, a heavy stocking soon left it optional with the rabbits to take the bait or starve. Good attractive bait, under these conditions, was found irresistible, and thus the trouble was overcome. So successful was the scheme that portions of land, hitherto regarded as a menace and useless from a grazing point of view, became heavily grassed a few months later, and came in handy as occasional depôts for weak sheep.

Destruction of harbour, wherever practicable, was carried on, and the maintenance of all netting fences, gates, &c., was under constant supervision.

The freedom of such an extensive and valuable tract of country was matter for much satisfaction to the owners and myself, and should be ample demonstration of what can be accomplished by systematic work.

From 1911 to 1915 I was rabbit inspector to the Pastures Protection Board at Condobolin, and came in contact with many landowners who had been fighting the pest for years with more or less success. Several large property owners had been convinced of the futility of haphazard work, and gone for the more reliable and permanent method of destruction of harbour, and are satisfied with having adopted it.

Ploughing-out and fumigating were methods much in favour, and I am satisfied that they are fatal to "bunny" if sufficiently well done.

In March, 1915, I left Condobolin to take up similar duties at Moree, and since then have had experience of the latest make of fumigating machines, rabbit traps, poison-bait mixtures, and decoys.

Breeding.

Much argument has been indulged in as to the fecundity of rabbits. Many landowners aver that they are prolific enough to breed every month of the year. To say that they breed at any time, and every month of the year, is quite unnatural and opposed to fact.

The breeding period is regulated more by the season than by anything else. The age, too, at which the rabbit commences to breed has been matter of much discussion; but, in my opinion, they rarely, if ever, breed until the female rabbit is full-grown, say, from 4 to 6 months old.

The period of gestation is twenty-eight days, and, under good pasture conditions, only a few days elapse, after giving birth, before the mother seeks her mate again. That she becomes pregnant whilst in a milky state is highly improbable. Should she be deprived of her young in the early stage of their life, no doubt her sexual proclivities would be hastened.

The "buck" rabbit, as often as not, destroys the young kittens when the chance occurs. This was, it may reasonably be supposed, the cause of the breeding doe moving away from the "colony" and making her nest more secure for the young.

These nests or breeding burrows, where conditions favoured, in time became warrens, and their infestation only a matter of time. Fresh breeding grounds were then sought, and thus the spread of the pest went on, and whole tracts of suitable burrowing country were linked up as one almost interminable rabbit warren. In this way the rabbit spread like an octopus throughout the State.

Natural Enemies.

Of late years one rarely comes across one of these breeding burrows, and some of our inexperienced landsmen may ask why. Simply because the doe, since the fox has appeared on the scene, has of necessity kept to the larger and deeper warrens, and has reared her family there.

I venture to state that, had the fox been in evidence earlier in the rabbit period, much country which is now honeycombed with burrows would never have been spread upon.

To the average thinking man or student of nature this must appeal as a fairly correct hypothesis, viz., that the fox, although most of us have a set against him, may be credited with having, in a very appreciable degree, during the past few years, done much towards preventing the spreading of the rabbit pest. He is the very best rabbit destroyer we have on country devoid of logs or other ready-made harbour. That he, in turn, may constitute a grave menace to sheep-breeding is matter for much serious thought. There is consolation in the fact, however, that his capture by poisoned bait does not call for much skill in its preparation.

The "goanna" is another of our rabbit enemies, and as he can get into almost any rabbit harbour, accounts for many young ones. They are not, however, considered of much value in a general way, firstly, because they are not really numerous anywhere, and, secondly, because they lie dormant for several months of the year.

The eagle-hawk and crow are forces to be reckoned with, and should a rabbit wander any distance from home in open fields, and no shelter be near, his early downfall is certain. Where the rabbit harbour has been destroyed the hawk and crow do the most good, and are instrumental in preventing the spreading of rabbits to other parts of holdings which may be favourable to their infestation.

Methods of Rabbit Destruction.

The question of rabbit destruction, and how to accomplish it, is a matter of much concern, and it is regrettable that, in the early history of the rabbit pest, men on the land did not grapple with the evil before it got out of hand.

It was largely a matter of sheer neglect and indifference that has led up to the present-day trouble and expense, the extent of which is almost beyond computation.

It is more regrettable that many of our landowners, despite the object-lesson taught by the failure of those who were the first victims, still regard the rabbit pest with an indifference which is unpardonable.

In almost every part of the State rabbits are reported as on the increase, and slowly but surely settling down on country which was classed as unsuitable for them. In some parts of the State rabbits have taken the place of valuable wealth-producing stock, and rabbit-freezing works have been established. A parasitical industry, surely!

Destruction of Harbour.

This may appear a costly undertaking, and to some practically impossible, but I have yet to meet the man who, having adopted it, is not satisfied with the result.

Burn all hollow timber and clean up all rubbish, tree-tops, &c., getting rid of anything and everything which affords shelter.

Dig out, thoroughly if possible, all rabbit warrens, and even the smallest burrows. Never lose sight of the fact that the small burrow of to-day will, if neglected, be the warren of the near future. Do it now, and save much worry and expense, and more than likely prevent the formation of other underground workings in that neighbourhood.

When digging out the burrow the trenches should be kept open, as some of the shoots or channels may be missed, and these can be located much more easily later on. After the lapse of a few days, and there is no doubt as to its freedom, the burrow should be filled in as level as possible.

Where burrows exist around trees or stumps, it is a good plan to dig out all channels possible, and then set fire to the tree or stump. You will probably get the rabbits that are within by the burning out of the roots of the tree.

Ploughing-out is a method of harbour-destruction which can be done successfully in many places, and may be less expensive than digging. Two men, having a good strong team of bullocks and the present-day road or tank-sinking plough, will average as much work as a dozen men in a day employed in digging-out. The plough will break up the warren to a depth of 2 feet, and the bullocks will, in many places, break through and pulverize the earth beneath their feet where the burrows are, and by this means the rabbits are often suffocated or driven out, and their home destroyed. One of the strong points about the ploughing-out method is, the whole of the warren is sure to be destroyed to a uniform depth, and should there be deeper channels, and these be found active later on, the treatment by a fumigating process will soon end the trouble.

Fumigation.

This is a method which, if carefully attended to, accounts for many of the pests. The best time of the year to fumigate is during the winter months, as there is less likelihood of the gas or smoke mixtures escaping, the ground being less porous than it usually is in dry, hot weather.

Where the burrows are not large, bisulphide of carbon is a good medium, and can be used in several ways. As it is of a most inflammable nature, great care is necessary, and on no account should fire be allowed to come in contact with it while using. Always keep it in a cool place, and make sure that the drum or jar containing it is securely corked or stoppered, otherwise it will waste by evaporation quickly.

It may be used in the following way:—Roll into balls about the size of an egg pieces of cotton-waste or old bagging, and saturate them with the carbon. Do not lose any time over it, as evaporation is going on, and the ball be fast losing its strength and deadliness. Place the ball in the burrow, sufficiently far to prevent its being smothered by the earth which is filled into the opening. Repeat this work by placing similar balls, saturated (as instructed) by carbon, and closing securely, so as to prevent the escape of the gas given off in the course of evaporation. Each opening requires a ball or wad before closing.

Another method of using carbon bisulphide is per medium of a small portable machine, which generates a gas from the liquid, and is forced through the burrow, and is very deadly in effect. I do not, however, recommend its use in treating large warrens.

For the treatment of large warrens there is a machine, which is strong and made to stand reasonably hard usage. It is mounted on a two-wheeled cart, with good springs, which enables the operator to travel comfortably and quickly to and from the scene of operation. The material used in this machine is mostly new charcoal, with the addition of a composition of a poisonous nature supplied by the manufacturer. The cost of the fumigating composition is not high.

Poison Bait; how, when and where to lay it?

In the preparation of bait one cannot be too careful or exact. It is false economy to mix old stale bait with the new, and it is better to do away with it altogether than risk spoiling the lot.

There are times, of course, when rabbits will eat almost anything; but, generally, they are most fastidious, and it is necessary to cater for them in the most attractive manner possible. Many failures are due to careless preparation of bait, and users are discouraged, and often reluctantly abandon the work.

Rabbits frequently recover after partaking of inferior bait, and when this happens they become what is termed "poison-shy," and it is almost impossible to poison them afterwards. That an instinctive scare takes place, and may be imparted to other rabbits, is quite feasible. Where they are numerous, I cannot urge too strongly the necessity of putting out a liberal supply of good, strong, attractive bait. Even where it is thought rabbits are not plentiful, do not spare the bait, and fall into the common error of treating only the most infested portions of your land. Every rabbit counts, and it pays to get the stragglers, and prevent the formation of new colonies.

To get the best results by poisoning, I advise commencing at one side and work the paddock in sections. It is a mistake to put a trail down here and there, as is usual where the work is hurried, and it is expected to poison a large area in the one day. Insufficient trailing and bait-laying means going over the same ground after a while, and is not satisfactory to anyone concerned.

Where the warrens are large and badly infested, they should be encircled by several trails, half a chain apart, or as close as may be considered necessary, having due regard for the conditions existing, viz., bareness of the land from feed, and the presence of young or half-grown rabbits, that feed close to their home.

The best time of the year to poison rabbits is when the grass or herbage is dry, that is, during the summer months. Get to work as soon after rain as possible; the fresh-turned soil is attractive, and rabbits will run the trail eagerly while there is any moisture about. Should the weather be very hot, it is best to lay the bait in the afternoon, otherwise it will become very dry and hard. During the cool weather the work can be done throughout the whole of the day. Do not allow dogs to follow you and chase rabbits while poisoning, and avoid disturbing them in any way. It is a good plan to collect all dead rabbits as quickly as possible from the trails or wherever they can be got, for many obvious reasons.

Poison Baits.

There are so many preparations now on the market, and full instructions on each packet or tin, that it is needless to give particulars here.

Where much poisoning is required, the question of cost is a consideration; I shall, therefore, give directions how to prepare a serviceable and comparatively inexpensive bait.

Phosphorised Pollard.

Ingredients.—Phosphorus, carbon bisulphide, molasses, oil of aniseed, pollard and bran.

Take a clean pickle bottle, and half fill it with water, adding two tablespoonfuls of carbon (this is merely to dissolve the phosphorus, and a lesser quantity will do if it is allowed to stand overnight), then break under water, and add to the contents of the bottle two sticks of phosphorus, and in an hour's time the mixture will be ready for the pollard, &c.

Procure a tub (a wooden one is best) and put 2 gallons of clean water into it. Then stir in a quart of molasses, and a teaspoonful of oil of aniseed. Add the contents of the pickle bottle, straining through a piece of chaff-bag or hessian (in case of undissolved particles of phosphorus). Stir well to thoroughly mix, then add the pollard, which, if very fine, will be all the better of a few handfuls of bran. Keep stirring and adding pollard slowly, until the right consistency is obtained. Your bait is now ready for use. Be careful not to make it too stiff at first until it is tried in the poison-cart. See to it that the cart is in good working order and free from any old sour bait, also that no string from the pollard bag gets into the mixture and interferes with the proper working of the machine. The above mixture should be laid whilst fresh and sweet, and on no account must it be allowed to become stale or sour before it is distributed. It may, in cool weather, hold sweet for a day or two, but the fresher it is the better.

There is absolutely no danger of fire if the above directions are attended to, and the above quantities will provide enough bait for a full day's work, if put through the usual form of poison-cart.

The comparative cheapness of the ingredients is a recommendation where much poisoning is required.

Great care should be taken in the keeping and handling of phosphorus, and a few hints may be serviceable, to put those who have not used it on their guard against possible accident or loss of property by its ignition.

Always keep the phosphorus under water when out of use, and do not store it in the dwelling or other outhouse if you value their safety. It should be always kept in a small detached shed, with an earthen floor; a shed in which could also be kept the other bait-making material and equipment. Dig a hole in the ground and thus lessen the risk of the tub or oil-drum which contains the phosphorus being upset. Be mindful of the necessity for keeping it well under water, as should it be exposed to the air (the water having dried off), in a very short time it will ignite.

It is advisable to keep this shed or depôt locked and secure against entry by children or others unacquainted with poisons.

Always keep a bucket of water by when handling phosphorus; one can, with safety, take the stick of phosphorus and break it under water with the naked hands, and put it into the pickle bottle to dissolve, providing there is no delay in the operation, and that the hands are washed afterwards. Phosphorus will keep an indefinite period while under water, and retain its poisonous qualities, but as soon as it becomes dry it burns right away—hence the necessity for extreme care in handling it.

Black Thistle Root and Strychnine Bait.

This has been successfully used in the Moree and adjoining districts during the past two years. I have seen splendid results obtained, and there appears to be absolutely no risk of stock picking it up, which sometimes happens with the pollard mixtures. Its preparation is at follows:—

Dig up green roots of the Black Thistle, and, having washed them free of soil, and scraped off the "whiskers," cut them into baits about half an inch square. Then place them on a clean chaff bag to dry out most of the natural moisture, and while this is being done the strychnine can be made ready for use. Grind to a powder as fine as flour an ounce of the best strychnine, and have the roots ready, the quantity of which can be measured easily by an empty 2 lb. jam-tin. Ten tinfuls of roots will yield approximately 2,500 baits, and by sprinkling them with the strychnine, and shaking them well, the poison will be well distributed over the roots. A small tin of a "decoy" sprinkled over the baits prior to the addition of the strychnine will help the roots to absorb the poison, and make the bait more attractive and tasty.

Thistle root and strychnine may be laid by hand in trails made for the purpose by a hoe or other trail-making means. Where extensive bait-laying is to be done, the ordinary poison-cart is best. Take off the gear-driving chain, and fix a large funnel above the spout of the cart, and the bait can be dropped through it into the furrow as close, or as far apart, as desired. Again I say, "make plenty of trails and do not spare the bait." This is a mistake too often made, and is a false economy of time and money.

This bait has the advantage of quick action, most of the rabbits being killed either right on the trail or at no great distance from it. This makes it an easy matter to gather the carcases, and secure the skins, if so inclined. The bait retains its destructive properties for several days, unless much rain falls on it; longer under fine-weather conditions.

Poisoned Water.

Water poisoned with Arsenic—

2 oz. arsenic.
4 oz. washing soda.
1 gallon water.

Boil the above quantities for half an hour or longer until the arsenic is dissolved, and when cooling add 2 oz. of sugar, and stir well. For use, add 2 gallons of water.

Water poisoned with Strychnine—

(*a*) 1 oz. of strychnine dissolved in a third of a pint of acetic acid will poison 12 gallons of water, or

(*b*) 10 grains of strychnine dissolved in vinegar will poison 1 quart of water.

Poisoned water used to be very effective as a method of destruction in the dry western portions of the State. Large numbers of rabbits were destroyed in this way, but the risk of poisoning stock and, indeed, all animal and bird life is a great drawback. I quote the directions for what they are worth, but do not recommend their general use. In our Eastern and Central Divisions it is well-nigh useless, and likely to be productive of more harm than good. Rabbits can exist in many of our districts almost entirely without water all the year round. They satisfy their want of water by eating the sap of tree roots and the bark and leaves of many of our edible scrubs. During a long dry spell of weather they acquire a taste for the bark of certain plants and shrubs detrimental to them.

Trapping.

Rabbit-trapping is a method of destruction which rarely gives much satisfaction. The professional rabbit-trapper will only work over the badly-infested country, and as soon as he has a few good catches he leaves for other parts. He is, however, only too willing to return in a few months, to continue the work, providing there is a good showing of large, full-grown rabbits in sight. The spring trap is most favoured by the "professional," and he "sets" where none but marketable rabbits frequent.

This trapping certainly has a thinning-out effect, but I find it has a tendency to scatter the pest far and wide, which ultimately leads to a greater increase. A good many landowners have experienced this, and on no account will they allow trappers to exploit their holdings. It is truly a parasitical industry at the most; and no part of the State can claim freedom from the pest where the work of rabbit destruction is left to the professional trapper.

Some patterns of rabbit trap are simple and easily set, and are most useful on river and creek banks, where it is impossible to dig out the burrows. In the hands of a good conscientious worker I have seen a total clearance made of badly-infested and deeply burrowed creek banks.

One man can attend to a couple of hundred of such traps daily, and after using them a while will be very successful. The young rabbits fall easy victims, but some of the old bucks are more cautious.

The pit trap, when properly made, and placed at intervals of about half a mile, along netting fences, is very useful. Its readiness to catch at all times, when in good working order, is its chief recommendation.

The double pit trap (*i.e.,* one that catches from both sides of a fence) may be made on the following lines:—Select a place, if on an uneven surface land where storm-water will not drain into, and put down a hole about 4 feet deep, 4 feet wide, and about 8 feet long. This gives a pit 4 feet square on both sides of the fence. To make it secure from breaking away, or the imprisoned rabbits burrowing into the sides, it is necessary to line it with strong, close-fitting timber.

The trap-doors (of which there are two on each side of the fence) should be 4 feet long and 6 inches wide, fitting closely, but not so as to jamb or prevent their easy swing on their pivot. The pivot, made of light iron, is fastened to the centre of the tip-door (crossways), and the ends of the pivot should rest in auger holes, which are made in the wooden frame at a point seen when the doors are placed in position. The ends of each pair of doors should meet, and thus form a level track or bridge.

As soon as the rabbit attempts to cross, and arrives over the hole, the door tips and he will fall through. The door then falls back into position and is ready for the next victim.

The doors may be made of light iron or light, tough board; but I prefer the light iron door, as it is not affected by the weather, which causes the wooden ones to swell and warp.

A couple of panels of wire-netting fence erected "V" shape at the ends of the pit are necessary to guide the rabbits on to the doors.

The top of the pit must be covered, a portion only left unfastened, so as to admit of a man going down to get the rabbits. The pits should be regularly visited and cleared. Leaving rabbits to die and decompose within the pit, or leaving any carcases close to the outside of it, will cause others to avoid it.

Do not allow the pits to be overgrown with grass; the approaches should be kept quite bare for several feet from the doors.

Rabbit-proof Fences.

For a distance of a chain or so a line should be cleared of all timber lying about, and of all standing trees which might fall on the fence. Dig out all burrows or warrens, however large they are, within that distance of the line, as they sooner or later cause trouble and annoyance, and impair the state of the barrier. This work is more easily and better done before the fence goes up, and has a direct bearing on its future upkeep and effectiveness.

The satisfaction of knowing that the fence is safe from breakage by trees falling across it, the advantage of being able to travel along it easily on horseback or by vehicle to inspect and repair, and in case of bush-fires, the benefit of such clearance cannot be over-estimated.

It is advisable to use the best grade of wire-netting, as its resistance against damage by stock (large stock especially) and its durability make for greater security and satisfaction. It is best to put the netting on the outside of the boundary fence (in watercourses hang it on the lower side) and tie securely to a No. 8 wire, which should be level with the top of netting. Attaching the netting to one or more wires in the fence a foot apart will strengthen it considerably, and hold it in an upright position. Always make sure that the netting is put straight in the ground to a depth of 6 inches. Some fencers, when putting up netting, especially when the trenching is hard and difficult, curve the netting a few inches under ground, and argue that it is better so. I am not of that opinion, and have had experience of its insecurity as compared with the way advised. Never lose sight of the fact that the fence, to be of the highest value, must be proof against rabbits from either side.

It is a mistaken idea to regard it as an advantage to erect the fence so as to make it easy for rabbits to get out of the holding, as he is almost sure to return to his burrow, and probably induce others to follow. This leads to a general "mating" and the inevitable increase. It naturally follows that the more rabbits are confined, the greater the check on their breeding; hence the importance of maintaining the fences rabbit-proof.

Where fences are erected across creeks or other watercourses, always hang the netting on the lower or down-stream side of it, as in flood time, or any extra downpour, the fence that is netted cannot resist the weight of rubbish which is almost sure to come along. Provision against destruction may be made in the following manner:—On the lower or down-stream side of the fence secure the bottom edge of the netting to a good bed log, which is fastened in the ground and will not wash out. Then loop up the netting on wire hooks in such a way as will give fair resistance in flood time, but will give way under heavy pressure, and, falling down stream, the water and flood débris will pass over it.

The netting, and possibly the other fence material, will thus escape damage, and the whole thing can be put in good order as soon as local conditions are again favourable.

Rabbit-proof Gates.

On roads where there is much heavy traffic it is important that gates be strongly made and well hung. Most of the travelling public have a great respect for good, handy gates, and rarely are they left open or interfered with in any way. Toward the other class of gate the public do not feel too kindly disposed, probably on account of the owner's indifference.

Always hang the gate on a separate post, and a little higher than the existing surface of the ground thereabout. This will permit of putting in a fair-sized ground plate, and building up the roadway so as to prevent water lodging there. The ground plate should have a flat surface, and will be all the more durable and firm by a heavy plate on each side. These will, in the case of heavy traffic, prevent the main sill being displaced—a common occurrence where the single plate is put in.

When strainers are used as gate-posts, it is not long before there is trouble; a slight give in the post, through contraction of the wires in cold weather, and the gate is no longer rabbit-proof, and very often the clasp or fastening becomes insecure.

All gates should be of good width, to lessen the chance of a breakage through careless driving or other contingency.

Guard posts, firmly erected at right angles to the gateway on both sides, will prevent much damage to gates and the gate-posts.

All rabbit harbour and rubbish should be got rid of for some distance around the gateway. This is most necessary, and it constitutes a menace of more magnitude than most people are aware of. Stock (especially sheep) passing through a gateway will often cause an accumulation of odds and ends right at the gate. This interferes with its proper closing, and likely breakage. A little attention to this little matter at once gives a lasting satisfaction and saving of expensive repairs.

Leaving any netting gate open on a rabbit-proof fence is punishable, and the Rabbit Act imposes a severe penalty on persons so offending.

Detrimental Effects of Rabbits on Pasture Lands.

That grazing lands are rendered almost useless when fed upon to any extent by rabbits is undeniable, and I have seen many striking instances of this.

Rabbits not only eat out the most succulent herbs and young sweet grasses, but their very presence has a sickening effect on all pastures with which they come in contact. This is most noticeable on lightly-grassed lands, and their carrying capacity is, even through fairly good seasons, greatly reduced, if not eaten right out.

In the richer soils (river and creek frontages) a recovery is soonest made when the season is favourable, the poorer class of country showing the ravages of the pest, even under light stocking conditions and better times.

The loss of many valuable stock, so often put down to unfavourable seasons, is attributable to the rabbit in many cases, and is of too frequent occurrence. It is generally conceded that half a dozen rabbits will eat as much as one sheep, but the amount of feed destroyed is incalculable.

The rabbit is a close feeder, and will make a clean sweep of all young grasses and other edible plant life when hard pressed for food.

Can the almost total disappearance of many of our good old natural grasses and herbs be considered at all surprising?

The belief by many, whose districts have not been as yet intruded on to any extent, that rabbits will not do any harm, &c., is being rudely dispelled within the last few years. Rabbits have been slowly but surely spreading their forces in parts of the State hitherto thought unsuitable for them. Unfortunately, many people are inclined to treat this matter lightly, and do not concern themselves until the trouble becomes of much importance. To cope with it then means a heavy expense, and the waste of much valuable time, often with very unsatisfactory results.

Rabbits as Revenue-producers.

The establishment of freezing or chilling works, at various centres throughout the State, where many thousands of rabbits are received and treated annually, are monuments of carelessness and inactivity on the part of many landowners.

That this industry affords remunerative employment to the casual or itinerant worker is undeniable; but the fact remains that it is a parasitical incubus. Such labour, were the rabbit non-existent, would be absorbed by more reproductive concerns, and be of more value to us all.

The rabbit revenue can only be accounted for at the expense of our primary industries, and the sooner it is regarded in that light the better.

Powers of Pasture Protection Boards.

Act No. 35, 1912, confers power on the Pastures Protection Boards to compel owners or occupiers of land which is rabbit-infested to destroy all rabbits, at their own cost, which may, from time to time, be upon their holdings.

The Act further provides, "that in the event of an owner or occupier failing to destroy rabbits to the satisfaction of the Board, any person authorised by the Board may enter upon such land and use such means and take such measures, and do and perform such acts or things as to him may appear proper and necessary to be done to ensure the destruction of all or any of the rabbits upon such land."

Sale of Merino Rams.

NYNGAN DEMONSTRATION FARM.

THE Department has available for disposal a number of flock rams and a few selected rams, and it has been decided to offer them by public auction at the Farm on 17th July next.

The sheep are of the long-stapled, robust-woolled, plain-bodied class, and have been bred essentially with the object of withstanding the dry hot conditions of the Western country.

The flock is mainly of South Australian origin, but it has been strongly infused with Wanganella blood. For a description of the flock, and the object of its establishment, readers are referred to the following paragraph, which appeared in the Sheep and Wool Expert's annual report to the Department, of 1917 :—

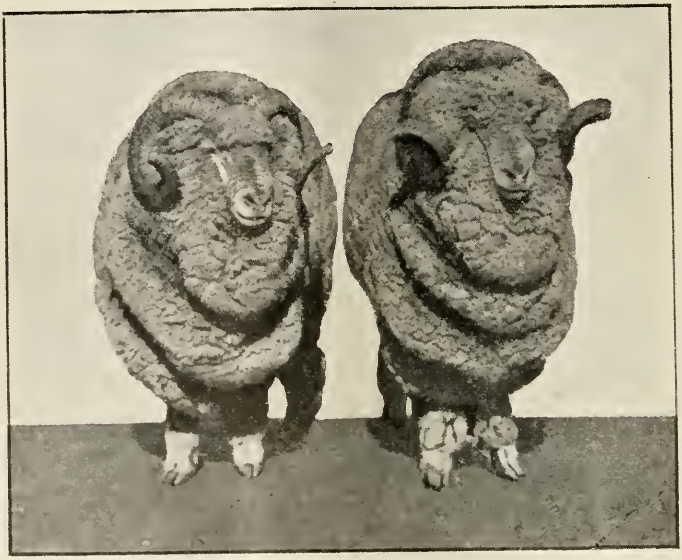
> *Nyngan.*—Perhaps one of the most important phases of sheep breeding undertaken by the Department is the establishment of the pure Merino flock and the line of breeding undertaken at this farm. Extensive as operations in sheep-breeding may be within the district in which the Nyngan Farm is situated, there is no denying the fact that the development of a type essentially adapted to the conditions would be of the utmost importance to the country and to the breeders concerned. Primarily the object in view was to test the physical endurance of a Merino strain under conditions somewhat more severe than those obtaining in districts east of the Bogan River ; as well as to institute investigations to ascertain to what extent, in a climate favourable, the Merino may be developed on plain-bodied lines.
>
> Seven years have now elapsed since the work was first undertaken, and although it is perhaps even too soon yet to speak over-confidently as to the merits of the sheep, it is not too much to say that the results so far have fully justified the undertaking. Ever since the work was entered upon the seasons have been of an in-and-out nature, and, with the exception of the last, there cannot be recorded a single year when the rainfall has been above normal. The soil, too, which comprises the Farm area, is by no means the best in the district. By many it has been thought unsuitable for the purpose. Yet the sheep have not only weathered the conditions, but have shown unmistakable evidence of responding to the environment. As to the characteristics it was sought to develop, these may be judged from a perusal of the following weights of wool which were taken at the August, 1916, shearing, after the sheep had gone through the first half of a very dry year.

		lb.	oz.
6	Stud rams (without belly wool)	20	5
28	Ram hoggets	16	13
304	Selected ewes	12	8
342	Flock ewes	10	8
189	Hogget ewes	10	6
308	Lambs (4 months)	3	14

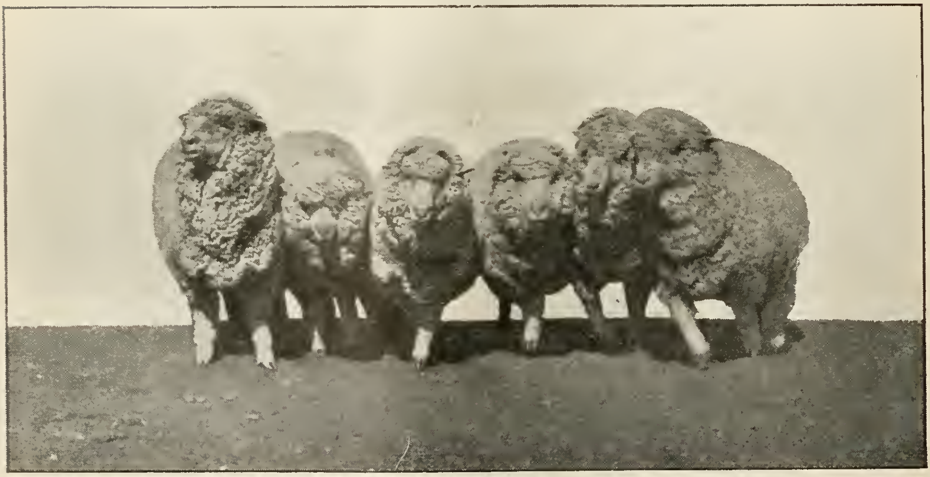
During the year a line of wethers was sold at the age of 15 months for 35s. each on the property. The weights of some of the most forward of the draft on being taken yielded a 60 lb. carcase.

At the 1917 shearing the following weights of wool were recorded :—

		lb.	oz.
12	Stud rams averaged	22	0
6	Hogget rams (reserved)	18	0
379	Selected ewes (rearing lambs mentioned below)...	12	11
362	Flock ewes (rearing lambs mentioned below) ...	10	8
462	Lambs	4	8



Types of Stud Rams, Nyngan.



Group of Ewe Hoggets.

MERINOS AT NYNGAN DEMONSTRATION FARM.

Group of Stud Ewes.

Type of Flock Rams bred at and distributed from Nyngan.

MERINOS AT NYNGAN DEMONSTRATION FARM.

All the young rams, except the six reserved as above, were sold in the wool prior to shearing, so that the averages cannot be shown, but the draft of wethers previously referred to yielded on the average, for twelve months' growth, 14 lb. 4 oz. of wool.

It might be mentioned that the object primarily in view in the establishment of the flock was to test the type under the conditions stated rather than to enter into competition with private breeders in the sale of stock. The sheep, however, are carefully graded and culled each year, and with a surplus available the public are given the opportunity of acquiring small drafts and of testing the strain on their own properties.

With the exception of a few that will be reserved for use in the flock the sheep to be offered will include the entire 1917 drop. They will comprise between sixty-five and seventy flock rams, which will be divided in two grades, and about fifteen selected rams of a better class.

The flock rams will be offered to suit purchasers in pens of five. The selected rams will be offered in single lots. The accompanying illustrations may convey some idea of the type.

The animals will be available for inspection on the morning of the day of the sale.

For further particulars, application may be made to the Manager, Experiment Farm, Nyngan; or to the Under Secretary and Director, Department of Agriculture, Sydney.

THE ERADICATION OF STINKWORT.

STINKWORT (*Inula graveolens*) is getting such a hold on New South Wales, and is so much better known and understood in South Australia and West Australia, that the following hints regarding it will be appreciated by farmers who have to cope with the pest:—

"Granite," Meckering, writes to the *Western Mail*, Perth, Western Australia:—*Re* inquiry about stinkwort. If he has a flock of sheep he need not worry about this plant, as they will keep it settled, if put on the land when it comes up, or when it is just above ground. I have fields this year in which sheep have been running, and there is not a plant to be seen, while in the adjoining paddock there is a most luxuriant growth. If, however, it is allowed to get a good start on the fallow it is difficult to deal with, and not even a duck-foot cultivator will root it all up. It is surprising the resistance a good old strong plant will offer. If the growth is not too thick, I think the less of it that is pulled up the better, as it is a greater source of annoyance when lying about than when standing. When drilling, a spring-tooth cultivator is as good for this purpose as any. It does not affect the crop if left standing, though it is a bit of an eyesore until the wheat hides it. The following year let it get a good start in the stubble, and drop a match on it, or stock it as soon as the wheat is off. Sheep will finish it every time. It does not injure sheep while in the green stage, but I have seen big losses through turning sheep, more especially ewes in lamb, on it while it was in flower. There has been a great outcry about this weed, but the farmer need not worry over it. In South Australia, twenty years ago, it used to be in a thick mass over every wheat field, and to fallow they used a chain and weight as a drag, and turned it under, not leaving a leaf showing. Those same fields, with the advent of superphosphate, grew better stinkwort, and they also grow some of the best wheat crops in Australia.

The Peanut.

[Continued from page 343.]

W. D. KERLE, Assistant Inspector of Agriculture, and Experimentalist,
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Yields.

THE statistics of peanut production in the United States of America show a total annual yield of approximately 7½ million bushels. The average obtained per acre is in the vicinity of 34 bushels. American writers consider that good peanut land, properly prepared and fertilised and under a good system of rotation, should produce in a normal season a yield of 50 bushels of nuts per acre, and from 1 to 2 tons of hay. Although yields of 100 bushels are not uncommon, a 70-bushel crop is regarded as high, and is estimated to give a net return of £15 to £20 per acre.

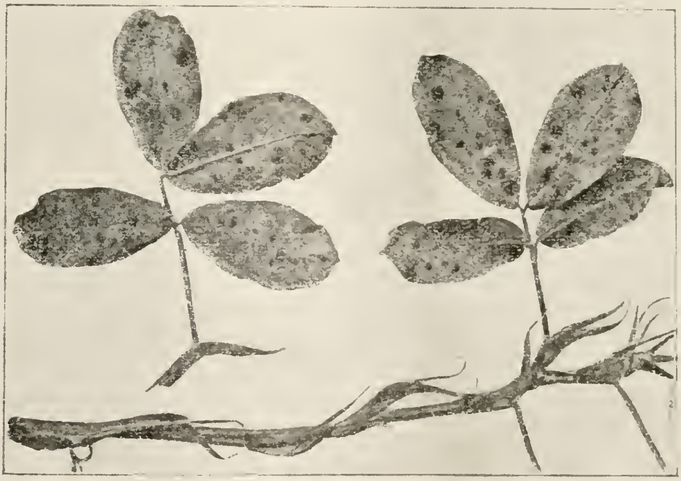

Fig. 15.—Peanut leaves attacked by a leaf spot fungus, probably *Cercospora personata*.

In view of these figures, the yields obtained in the trials conducted at the Departmental experiment farms afford a striking contrast, and emphasise the potentialities of the industry in this State. The highest recorded yields at Grafton Experiment Farm are 124½ bushels of Virginia Bunch, 121 bushels of Spanish, and 112½ bushels of Valencia, with an average yield for three years of all varieties of nearly 100 bushels. At Yanco Experiment Farm 117¾ bushels of Local, 107¾ bushels of Valencia, and 84 bushels of Spanish are the highest yields recorded, with an average almost equal to Grafton. Even at Hawkesbury Agricultural College, where the climatic conditions are anything but suitable, a yield of 68¾ bushels has been obtained with Valencia. Exceptional yields of hay have also been obtained, notably 2¾ tons at Yanco

Experiment Farm and 2¼ tons at Grafton Experiment Farm, both from Valencia. These returns are not to be regarded as exceptionally high, since in no instance was artificial fertiliser applied. With careful field selection of seed, judicious application of fertilisers, and improved methods of harvesting, it is safe to assume that the yields could be appreciably increased.

Diseases.

Probably the very limited area of peanuts grown in the State is accountable for the absence of any serious diseases. An insignificant attack of a leaf-spot fungus (probably *Cercospora personata*) has been noticed (Fig. 15). It is a fungus which attacks the leaves, particularly during the early stages of growth, in wet seasons, appearing as small, yellowish-brown spots. The disease has not been of a general nature, but confined to low-lying portions of the field. No falling-off in yield has been attributed to the disease, although if it were more general that effect would undoubtedly follow, as well as a considerable decrease in the value of the vines for hay.

Considerable damage has been done to the peanut crop in India,* Java, and German East Africa by a fungus disease, *Septoglœum arachidis.* It attacks the leaves and stems, being indicated by brown spots surrounded by yellow rims, and causing the leaves to wither and fall off. Undeveloped and hollow pods result, with an inevitable and serious falling-off in yield.

Fungus diseases of the above nature can be controlled by spraying with Bordeaux mixture.

Insect Pests.

No attacks by insects on the peanut plant have as yet been recorded in Australia. Injurious insects may be classified with respect to the peanut as those attacking (1) the growing plant and (2) the nuts in storage.

In view of the probable development of the peanut industry in Australia, a review of the insects found injurious in other countries may be of interest, since the depredations of insects usually extend with increased production.

In the United States† a species of aphis has been reported as attacking the roots of the plant. No great damage has been done by these pests, but their spread is very likely.

Various insects have also been found doing considerable damage to the stored nuts. Lefroy‡ gives the peanut as a food plant in India of the hairy caterpillar (*Prodenia litura* Fabr.). It is a serious pest which, feeding on the leaves, completely skeletonizes them, in time destroying the entire crop if not checked.

From Nigeria§ are reported attacks of a more or less serious nature by psychid caterpillars (*Metisa sierricola* White) and a scale insect (*Ceronema africana* Macfie).

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* Bul. No. 41, Dept. of Agr., Bombay.
† Farmer's Bull. 431, U.S. Dept. of Agr.
‡ The Review of Applied Entomology. Vol. i, p. 482.
§ Bull. Entom. Research, London, Y, Pt. 3. Dec., 1914.

The peanut is one of the chief sources of wealth in the French colony of Senegal.[*] There the growing nuts are attacked by termites and by the larvæ of an elaterid beetle. These pests pierce the shell, providing breeding facilities for storage insects, and often eating away the entire nut. Stored nuts and meal are attacked by various insects, particularly the larvæ of the pyralid moth (*Plodia interpunctella*), the tenebrionid beetle (*Tribolium confusum*), and the saw-tooth grain beetle (*Silvanus surinamensis*).

In France,[†] and also in Senegal, the larvæ of a number of *Misrolepidoptera*, the commonest species of which is *Ephestia elutella*, have been reported as infesting peanut meal in storage, and doing considerable damage.

Ballou[‡] reports from St. Vincent, Barbados, attacks of the pentatomid bug (*Edessa meditabunda*), and also of other bugs, caterpillars and mole crickets.

From Russia[§], Vassilier records the attack of a leaf-mining insect (*Phytomyza geniculata* Macq.).

From the foregoing it will be observed that the peanut is prone to the attack of numerous insects, some, if not all, of which may make their appearance in Australia when the crop comes to be more generally grown. Parasites and predaceous enemies play an important part in the natural control of insect pests, but if remedial measures have to be resorted to, spraying with intestinal poisons, such as arsenate of lead, Paris green, &c., for leaf-eating insects, fumigating with carbon bisulphide for nuts attacked in storage, and systematic crop rotation for insects and disease attacking the nuts underground can be recommended.

Composition.

From the point of view of chemical composition the peanut appears to be one of the most desirable of farm crops.

The accompanying tables, compiled from American data, show the composition of the peanut plant from the standpoint of feeding and fertiliser value, and afford a comparison with other standard crops.

I.—TABLE of Food Constituents in various portions of the Peanut plant.[||]

	Water.	In water-free substance.					
		Fat.	Protein.	Nitrogen.	Nitrogen-free extract.	Ash.	Fibre.
Kernels	7·85	49·20	29·47	4·67	14·27	2·77	4·29
Hulls	12·94	2·68	7·22	1·77	19·42	3·39	67·29
Leaves	......	3·50	10·00	1·60	54·09	10·90	21·51
Roots	28·74	3·20	7·63	1·22	31·00	9·54	48·59
Stems	......	2·50	6·25	1·00	49·49	8·80	32·95
Vines (mature) ...	31·91	5·02	10·81	1·73	39·81	12·08	32·28
,, (hay)	7·83	1·84	11·75	1·88	46·95	17·04	22·11

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[*] Les Insectes parasites des Arachides au Senegal.—Azémard.

[†] Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux.—Kehrig.

[‡] Report Agric. Dept., St. Vincent, for 1912–13, Barbados.

[§] *Horticulturist and Market Gardener*, Kew, Feb., 1914.

[||] Encyclopedia of Agriculture.—Bailey.

II.—Table showing (1) the digestible nutrients, and (2) the average digestibility, of peanut kernels and cake in comparison with other concentrates.*

Feeding Stuffs.	Digestible Nutrients, per cent.			Average digestibility.				
	Protein.	Carbo-hydrates.	Fats.	Dry matter per cent.	Protein. per cent.	Carbohydrates.		Fat per cent.
						Fibre per cent.	Nitrogen-free extract per cent.	
Peanut cake ...	42·8	20·4	7·2	83	90	9	84	90
,, kernels ...	25·1	13·7	35·6	83	90	9	84	90
Cocoanut cake ...	15·4	41·2	10·7	80	78	63	83	97
Wheat bran ...	11·9	42·0	2·5	66	77	41	71	63
Linseed meal ...	31·5	35·7	2·4	82	84	74	80	89
Corn meal ...	6·1	64·3	3·5	88	66	...	92	91

III.—Table showing the Comparative Composition of various Hay Crops with Peanut Hay.*

	Water.	Ash.	Crude Protein.	Carbohydrates.		Fat.
				Fibre.	Nitrogen-free extract.	
Peanut vines without nuts...	7·6	10·8	10·7	23·6	42·7	4·6
,, with nuts ...	6·3	6·0	13·5	29·2	36·3	15·1
Lucerne hay	8·1	8·8	14·6	28·9	37·4	2·1
Clover ,, ...	9·6	8·6	15·2	27·2	36·3	2·8
Cowpea ,, ...	10·5	8·9	14·2	21·2	42·6	2·6
Wheaten ,, ...	9·6	4·2	3·4	38·1	43·4	1·3
Oaten ,, ...	9·2	5·1	4·0	37·0	42·4	2·3

IV.—Table of Fertilising Constituents in various portions of the Peanut Plant †

	In air-dried substance.					
	Water.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Total Ash.
Kernel	6·30	4·51	1·24	1·27	0·13	3·20
Vines (cured)	7·83	1·76	0·29	0·98	2·08	15·70
Hulls	10·60	1·14	0·17	0·95	0·81	3·00

These analyses afford very convincing evidence of the value of the peanut. The kernels are rich in protein, fat, and carbohydrates, while the vines, converted into hay, are only slightly inferior to that from clover and lucerne. The hulls, too, appear to possess some feeding value, and are used for adulterating feeding stuffs, and in some countries as a coarse fodder. Peanut meal, which is the ground residue from oil extraction, is a highly concentrated material used extensively for stock feed. It is exceptionally rich in protein, and for feeding purposes compares favourably with linseed meal, coconut oil cake, and most concentrated foods.

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* Feeds and Feeding.—Henry. † Encyclopedia of Agriculture.—Bailey.

The proteins of the peanut, arachin and conarachin, contain 18·29 per cent. of nitrogen. Conarachin, moreover, contains 6·55 per cent. of its nitrogen as basic amino acids. This is the highest recorded percentage of basic nitrogen in any seed protein. Peanut meal or cake may therefore prove very effective in supplementing cattle food products made from cereals and other seeds, the proteids of which are deficient in basic amino acids.*

The peanut, in common with all leguminous crops, is rich in nitrogen, and contains considerable quantities of potash, phosphoric acid, and lime. The nitrogen is almost wholly extracted from the air, and its application is therefore unnecessary, but commercial fertilisers may be used to supply the crop's needs in other essential plant food elements.

(*To be continued.*)

A WEED NEW TO AUSTRALIA—SPIKEWEED (*Hemizonia pungens* TORR AND GRAY).

A SPECIMEN of this weed was forwarded by Mr. S. F. Mudge, Shire Clerk, Albury, to the National Herbarium for identification and report. Mr. Mudge has kindly supplied the following information :—

> The Manager of Walbundrie Station (near Culcairn), on which this plant was found, advises that about twenty plants appeared in cultivated ground this season, but it has not been seen before. So far as he knows, no seed from America has ever been sown on his property. The plant grows about 3 feet high, and is very bushy, with branches from the main stem about every inch.

The weed belongs to the Daisy family (*Compositæ*), and has a somewhat woody stem, narrow, clustered, prickly leaves, and a divaricate habit of growth. The flowers (flower-heads), which are about ½ inch across, have narrow yellow petals (the ligules of the ray florets), notched at the apex, and are seated on short branchlets, ½ to 1 inch long, rising from the upper branches.

It is a native of California, and is indigenous to that State only, but it has migrated as far north as the State of Washington. Though it does not appear to have become troublesome in the United States—it is not mentioned in Ada E. Georgia's work on the "Weeds of the United States and Canada" —we have no guarantee that it would not spread and become a pest in New South Wales, and it should not be allowed to get a footing, for it is prickly and threatening.

As is the case with most shrubby members of this family, its only method of reproduction is by means of seeds, which in this plant are not freely produced, and are without the means of spreading possessed by many of its congeners, *e.g.*, the thistle-down, and if the seeds are not allowed to ripen the eradication of the plant is assured.

In his "Synoptical Flora of North America," Asa Gray includes this species among the Tarweeds; but in a recent work on the Compositæ of Southern California, "University of California, Publications in Botany," vol. 3, p. 1 (1907), the author, Harvey Monroe Hall, gives it the vernacular name of "Common Spikeweed," an allusion to the spike-like leaves. As the Common Tarweed (*Madia sativa*) is present in this State, it is considered advisable to use the Californian common name for this plant.—A. A. HAMILTON, Botanical Assistant, Botanic Gardens, Sydney.

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* J. Biol. Chem., 1916, 28, 77-87.

Notes on "Snow Flies."

WITH THE DESCRIPTION OF A NEW SPECIES (*Aleurodes alboflocosa*).

W. W. FROGGATT, F.L.S., Government Entomologist.

THE Snow Flies (Family *Aleurodidæ*) may be briefly described as a very distinct group of homopterous insects closely related to the *Coccidæ* (scale insects) and the *Aphidæ* (plant lice). They have some affinities with the *Psyllidæ* (lerp insects), as, like them, both sexes are furnished with two pairs of well-developed wings.

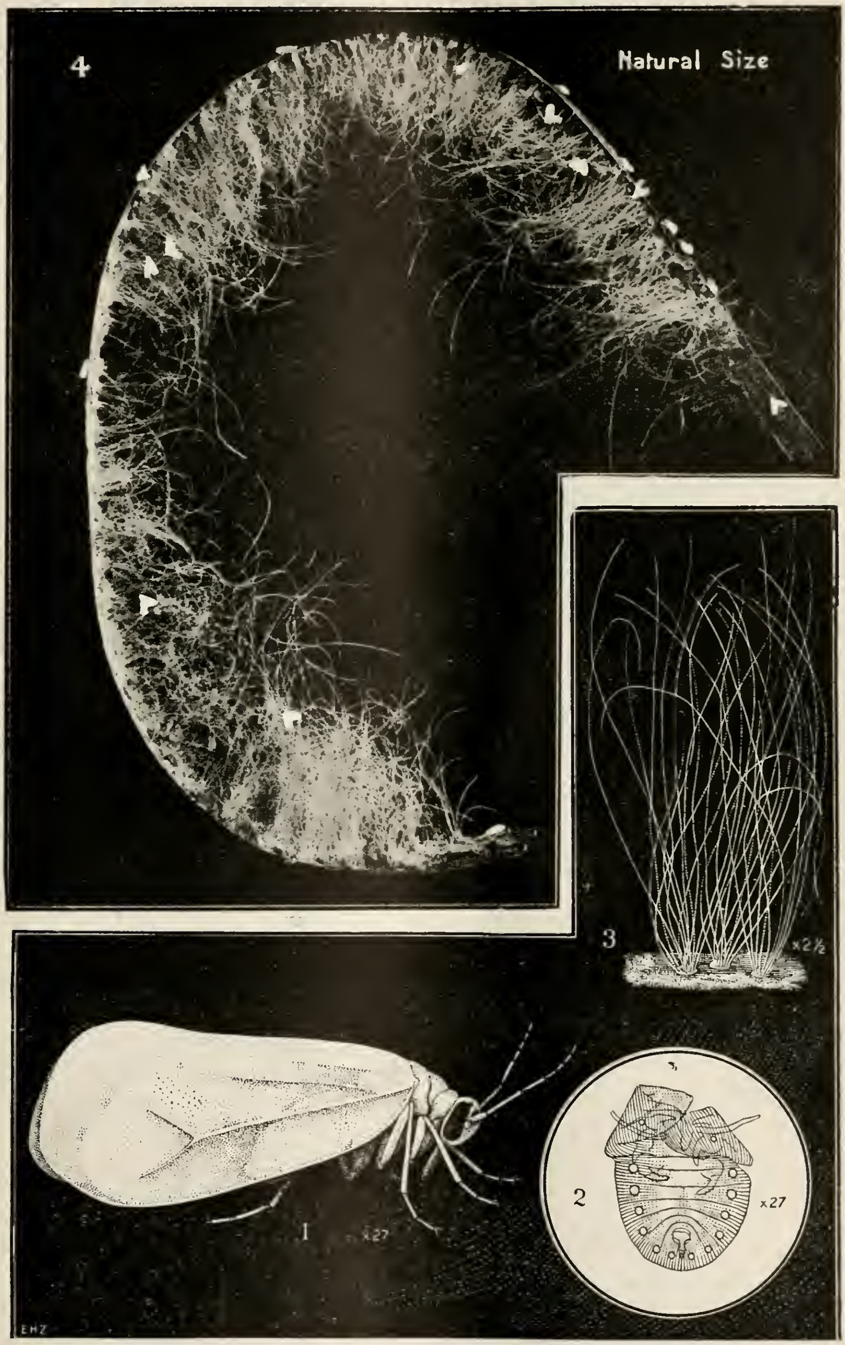
The venation of the wings is simple, consisting of only two parallel nervures like those of the male coccids. The body is soft and delicate, as in the adult winged aphids, and it shrinks so rapidly after death that it is very difficult to preserve snow flies as pinned specimens. The best method, after examining the living specimen and noting its colours and details of structure, is to drop it into oil of cloves, and after clearing it, to mount on a micro-slip for later observation.

The body is plump and round, generally of a light yellow colour. The short head is furnished with reniform brown or red eyes; the mouth consists of a jointed sucking tube (rostrum) turned down, when resting, under the thorax. The two pairs of large rounded wings and the body are thickly powdered with white, waxy, mealy dust, so that infested foliage looks as if it were covered with white spots. It is from this peculiarity that these insects take their popular names of "Snow" or "White Flies."

The females lay their eggs in clusters on the under-surface of the leaf, and the tiny larva on emergence settles down on the foliage, sucking up the sap and at the same time forming an enveloping test or sac under which it developes and pupates. These larval tests are often fringed or covered with white waxy or floury secretion; in other species the action of the larvæ causes regular depressions, or pits, in the leaf tissue in which they rest, with the dorsal surface level with the surrounding surface of the leaf.

It is in the larval or pupal stage that most of these insects are found and collected, and by the inexperienced observer are frequently mistaken for scale insects, to which their external form has a remarkable resemblance. Thus a large number of our species have been described from the tests of the immature insects, without any knowledge of the perfect insect; so that the life-history of every species, particularly one like this now figured, which forms such a beautiful test, is of considerable interest.

The Snow Flies play an important part in Economic Entomology, as they all feed upon the sap of plants, and there are several cosmopolitan species which have a very wide range. *Aleurodes vaporariorum*, a European species, has been introduced into many parts of the world with hot-house plants, and is common in Australia, where it has spread on to many dissimilar plants in



A "**Snowfly**" (*Aleurodes albofloccosa*).

1 Side view of perfect insect. 2. Pupal skin from which the perfect insect has emerged.
3. Diagram showing the structure of the larval tests under which the larvæ live.
4. The infested leaf covered with larval tests.

NOTES ON "SNOW FLIES."

the gardens and bush. Several monographs have been recently published in North America on "White Flies," dealing with native and introduced species; and considerable attention has been paid to the family in California in consequence of what was known as the "White Fly Scare," when in 1906-7 the "White Fly" of the orange (*Aleurodes citri*), which is a very serious pest in the citrus groves of Florida, appeared in several orchard districts of California.

In 1896 W. M. Maskell contributed an important paper on the Family *Aleurodidæ* to the Transactions of the New Zealand Institute, where he described eight new Australian species.

In 1911 the writer defined another species* under the name of *Aleurodes atriplex*, infesting the western bush.

The Woolly Snow Fly (*Aleurodes albofloccosa* n.sp.).

This insect has been found upon the foliage of *Banksia* and several undetermined scrub trees; it had been previously received from the Hawkesbury River and Paterson River in this State, and from Gippsland, Victoria. The specimens from which the species is described and figured are from a fine series collected by Mr. Harold Brooks, Dungay, Tweed River.

The under-surface of each leaf is thickly covered with floury meal on which rest, almost in contact, scores of rounded slipper-like tests, light brown in colour, measuring about $\frac{1}{10}$ inch in length; springing from the outer margin of each test is a fringe of about ten slender white, hair-like filaments, measuring from $\frac{1}{2}$ to $\frac{1}{4}$ inch in length. These curling and twisting round form a regular coating of moss-like structure over the whole surface of the leaf.

The adult insect is yellow, mottled with dull brown; antennæ pale yellow; eyes bright red, the legs marked with brown, darkest on the hind pair; the wings iridescent. The whole insect is so thickly covered with white meal or dust that all the colours are hidden until it is dusted or dropped in oil of cloves. Length, 4 mm.

The head is rounded in front, with large reniform eyes on the sides, with the basal joint of the antennæ springing from the curved notch on the side of the eye. The antennæ are composed of seven joints, the first thickened; second, longest; third, fourth, and fifth, slender; sixth and seventh of equal length; the terminal one rounded at tip. Thorax short; legs long; femora slightly thickened, rather hairy, with two apical spines; tarsi two-jointed, first long, the second with a terminal pair of long, slender curved claws. The wings are large, opaque, with two parallel nervures, the subcostal forking about a third from the tip, but the forks do not reach the outer margin of the wing.

The abdomen is oval in the female, with the first five segments small, the seventh very large, with anal claspers on the last segment. The male has a more slender body, terminating in two slender anal appendages on either side of the sabre-shaped genitalia.

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* *Agricultural Gazette*, September, 1911, page 757.

The Chinese Wood-oil Tree.

(*Aleurites Fordii* HEMSL.)

E. N. WARD, Superintendent of the Botanic Gardens, Sydney.

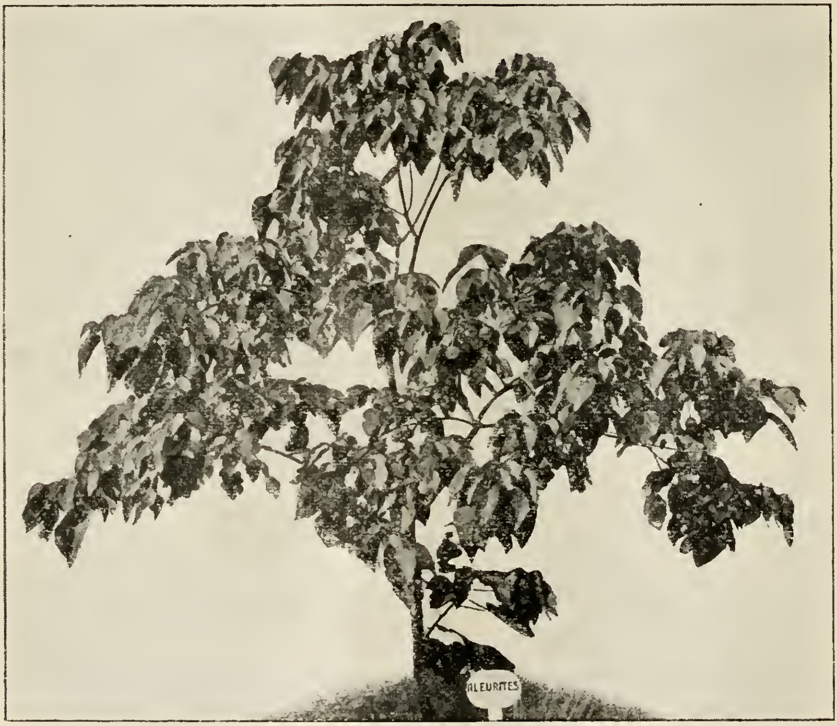
Aleurites Fordii, a native of China, belonging to the Euphorbia family, was introduced into the Sydney Botanic Gardens by means of seed sent from the Royal Botanic Gardens, Kew, England. These seeds were sown on arrival, but only one germinated. Care was taken of this plant in the nursery for eighteen months, when, in the late autumn of 1913, it was planted in bed No. 28 in the Middle Garden, with a westerly aspect, in soil that had been cultivated for over a century, surrounded by large and vigorous-growing shrubs and a few trees. Since it was planted it has received no special treatment, beyond the shrubbery being dug once a year, and the Dutch hoe being used to keep the ground clean from weeds. No artificial watering has been given at any time. In three years from planting, or four and a half from seed, the plant began to fruit. The photograph was taken in March of this year, and a few days later 1½ bushels of fruit were taken from it.

There are good reasons for thinking that this tree will, in the near future, prove to be a most valuable introduction, for, apart from it being a charming addition to our spring flowering trees, it is likely to be of considerable economic value.

It is the Tung oil-tree, and is the source from which the Chinese wood-oil is produced, and many districts in this State are admirably adapted for its growth. It will grow in almost any soil, will withstand droughts, and its natural distribution shows that it grows where there is a tropical summer, as well as where the winter is so cold that snow lies on the ground for days. According to E. H. Wilson, of the Harvard University, it occurs in the provinces of Tokien and Yunnan. Its centre of distribution is north-west Hunan and Kweichou, and the region contiguous to the Yangtze River, in western Hupeh and Szechuan, from the city of Ichang westward to that of Chungking. To the plantsman who has received such a wonderful wealth of plants from these districts during the past fifteen years, it is not difficult to see that this tree will grow almost anywhere in New South Wales, except in the very coldest districts. Further, in an American circular on the subject (Circular No. 108, Bureau of Plant Industry, U.S. Department Agriculture, April, 1913), it is stated that "This tree has fruited well in South Carolina, Alabama, Louisiana, Mississippi, Georgia, Texas, California, and Florida. In the last-named State one tree, raised from seed sent from Hankow, China, in 1905, bore 410 fruits in 1911 and 852 fruits in 1912, approximately 1 and 2 bushels respectively." As showing the importance the officers of the Department of Agriculture at

Washington attach to this tree, they are distributing one-year-old plants to *bona-fide* experimenters, with the view to creating acre plantations. The same circular states that, " The imports of this oil into the United States in 1911 amounted to 5,000,000 gallons, to produce which 40,000 acres of trees would be required, planted 20 feet by 20 feet—that is, 108 trees to the acre."

It is the purpose of the Director of the Botanic Gardens, with the approval of the Under Secretary and Director of Agriculture, to distribute one-year-old plants (grown in the trial ground of these Gardens) to all the Experiment Farms throughout the State, to be grown under orchard conditions. After such a practical test it should not be difficult to encourage private individuals to plant under orchard conditions also. So easily does the tree grow, that in China it is planted on rocky hillsides and places only where ordinary farming is impossible; but in the many large uncultivated places in this State, such as the arid areas of the Murrumbidgee irrigation district, the uncultivated slopes of the Hawkesbury ranges and the Kurrajong, it will be tested to see if it will pay to plant 20 feet apart and cultivate on orchard lines. There has been such a demand of late years for this oil



The Chinese Wood-oil Tree.

The specimen shown is 12 feet high, with a spread of 11 feet; it branches 4 feet from the ground. Date of sowing of seed, August, 1911; date of photograph, March, 1918.

that it has a recognised adulterant in bean-oil obtained from the Soy Bean, and, no doubt, as the demand increases, other adulterants will be used. Tung oil is largely used in the paint and varnish industry, being a good substitute for linseed oil, and in some cases superior to it. It is well known that linseed oil is becoming very scarce in this State, chiefly owing to the difficulty in obtaining bulk seed for crushing purposes, and this difficulty is likely to continue for some years to come, owing to freight difficulties. The cost of production and the high class of ground necessary for success in linseed cultivation is a great handicap.

The wood-oil tree is ornamental and fitted for a place in any garden or park. In spring it is a beautiful sight in the landscape, resembling a plum tree in full flower. Its flowers are white with pink and yellow markings. The leaves are deciduous, broadly ovate and heart-shaped at the base. The fruit contains three to four seeds, and are poisonous to man, causing severe vomiting and purging. According to the Bulletin of the Imperial Institute (V. 134, 1907), the kernels contain 58·3 per cent. of oil. The tree itself needs no pruning and no staking. The only pest that I have noticed has been a small scale insect, which was completely destroyed by one spraying with red oil (1 in 60); and, strange to say, this same insect appeared on seedlings grown a quarter of a mile away from the parent tree.

There are other wood-oil trees, the chief being *Aleurites cordata* R.Br., Japan; *A. montana* Wilson, South-Eastern China; *A. triloba* Forster, Malaya and Polynesia; and *A. trisperma* Blanco, Philippine Islands; but *A. Fordii* seems the best, producing the finest oil, and is the source from which the bulk of the exports from China is obtained.

Anyone desiring to further study this subject should refer to the following:—Hooker's Icones, 9, 2801-2; Kew Bulletin, 1906, 120; Bulletin of the Imperial Institute, 134, 1907; 441, 1913; Fairchild in U.S. Dept. Agric. Circular 108, 1913; and the Annual Report for 1915 of the Director, Sydney Botanic Gardens.

SOIL INOCULATION FOR LEGUMES.

WHILE up to the present the use of cultures for the inoculation of the soil has not proved successful in this State, it is of interest to note that in South Carolina sufficient success has attended the application of these bacterial cultures as to warrant the State Department of Agriculture entering into a contract with a commercial corporation for the supply of bacteria for all legumes at 40 cents (1s. 8d.) per acre, delivered to the farmer. The report of the Commissioner of Agriculture of that State for 1916, shows that cultures for 6,823 acres were supplied under the contract during the year. Of these, 2,928 were for cowpeas, 1,670 for "No. 1" clovers, and 553 for lucerne. No fewer than forty-four counties participated in the distribution, and reports state that the results are most satisfactory

A Fungus Disease of Prickly Pear.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist, and
HUGH ROSS, Chief Inspector.

A SHORT time ago Mr. L. A. McDougall, of Harrington Inlet, on the Manning River, forwarded to the Department some specimens of prickly-pear which he had observed to be affected with some kind of disease.

The specimens showed the disease in various stages of development. The outer portions of the young segments that had been attacked were dark grey or black in colour, and quite dry and brittle. A sharp line separated the healthy portion of the segments from the parts which were diseased. In the older segments brown, blotched, irregular areas were visible in various stages of decay, the base of the segments being most frequently attacked.

Examination of these diseased portions showed them to be traversed with dense masses of fungal hyphæ. From portions removed with the greatest care, Mr. Birmingham, assistant in the Biological Laboratory, isolated and obtained pure cultures of a fungus belonging to the genus *Fusarium*.

The spores are sickle-shaped, straight or curved, colourless, two-celled, and very irregular in size, ranging from 12μ to $22\mu \times 4\mu$.* The hyphæ are septate, sometimes moniliform, and often dark in colour. Upon glucose agar the hyphæ form a dense yellowish-brown mycelium; upon corn-meal agar the growth is not so luxuriant, the hyphæ are somewhat dark in colour, and grow, for the most part, below the surface of the medium.

Upon segments of the diseased pear spores are produced in large quantities. Numerous pustules make their appearance, and the spores are found as pinkish powdery masses above the ruptured epidermis. The diseased areas have gradually extended upon the segments of the pear kept in the laboratory.

We visited Mr. McDougall's farm at Harrington Inlet, and he courteously conducted us over the pear area where he had noted the disease. On first observing it in a clump of pear, he had made the interesting experiment of throwing segments of diseased pear into clumps of healthy pear far removed from the plant originally noted to be infected.

At the time of our visit this particular clump of pear was not completely dead. Many of the younger segments were dead and shrivelled, some of the older segments were rotten and filled with a slimy pulp, and most of the remaining segments were of a sickly yellow colour.

In those clumps of pear into which segments of diseased pear had been thrown similar conditions obtained, though the amount of decayed pear was not so extensive.

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* μ = 1,000th part of a millimetre.

Infection started in most cases at the base of the segments, and spread upwards, the junction of the segments affording, no doubt, a very favourable lodgment for the spores.

Where infection had taken place upon the surface of a segment, the extension of the disease was sometimes marked by more or less concentric dark lines.

In one case, part of the large pear segments, instead of being flat, had become almost cylindrical; they had almost lost their large and their small spines, and the production of numerous short segments gave the plant a dwarfed, tufted appearance. We have on several previous occasions, both at Scone and at Moree, noted this peculiar alteration in the normal growth of pear, and have no direct evidence at present that it is to be definitely associated with the presence of fungus disease. The species of pear attacked by the fungus was the pest-pear *Opuntia inermis.* Two or three plants of *Opuntia monacantha* were found, but they were obviously escapes from a neighbouring garden.

The pest-pear extended fairly thickly throughout a considerable area. The healthy plants had produced a remarkably large number of mature, healthy fruits; upon the diseased plants the number of mature fruits was much less, and many had shrivelled before reaching maturity. Though no plant was observed in which every segment had been killed, the diseased plants had obviously received a very severe check, and further progress of the disease may result in their extinction. The disease has been in progress about eight months.

The ground upon which the pear was growing was not such as one would normally expect to find pear growing upon. It was a deep sand, with a little loam, and contained an amount of humus greater than one generally finds in sandy soils. The rainfall of the district is good, and this year it has been exceptionally heavy and continuous.

Mr. McDougall has observed some of the plants producing a certain amount of gum; this is frequently an indication of waterlogging of the roots. The excessive rainfall may, therefore, have predisposed the pear to disease, though clumps not attacked by this particular fungus disease described above looked healthy enough.

Portions of diseased pear will be taken and introduced into other prickly-pear areas, to test whether the fungus can be used as a means of destroying or checking pear growth.

Poultry Notes.

JUNE.

JAMES HADLINGTON, Poultry Expert.

No time should now be lost in making a start with incubation, more particularly with the heavy breeds, which are somewhat slower to mature than the light breeds, and if winter eggs are to be obtained from them it is to the chickens hatched from June to the middle of August that we must look for supplies. The same applies to the stock required for breeding. The best birds in this class are usually those hatched during the few weeks between the middle of June and the end of July.

With regard to the light breeds, particularly Leghorns, many poultry-keepers do not commence putting down eggs to hatch until July or even August, being obsessed with the fear that the resultant pullets may break into moult at the commencement of the following winter, just when eggs are bringing high prices; but, notwithstanding this liability, it will be found more profitable to have early than late stock of any breed. My advice to poultry-keepers is to hatch, from this month onwards until the middle of September, all that is possible, and for which accommodation can be found.

It is a fairly general experience that the most likely pullets to lay in the following autumn and winter are, for heavy breeds, those hatched during July to the middle of August; while for the light breeds, particularly Leghorns, August up to the middle of September. The later date in each case, however, is a little too late to hatch breeding stock intended to be used the following season. But how many poultry-keepers are in the fortunate position of being able to hatch all they require within a period of six weeks? It is safe to say but few. The matter, therefore, resolves itself into whether early or late chickens shall be hatched.

The Late Chicken.

Of all the afflictions of the poultry industry, the most damaging is the "late chicken." A small proportion of poultry-farmers are now refraining from late hatchings. Most breeders have found that it is more or less unprofitable, but the desire for mere numbers of chickens at the end of each season proves an irresistible temptation to go on hoping (in spite of consistent experience to the contrary) that, in some way or other, the chickens may do better than they have previously been found to do. This warning is given in these notes in one form or another annually, yet hundreds of thousands of these late chickens are still hatched year after year.

In this connection it is worthy of note that, under the stress of war conditions, the United States of America Department of Agriculture has found it advisable to issue advice, with a view to encouraging early hatching as being profitable, and has pointed out that late-hatched chickens are found to be unsatisfactory, and a means by which the country is afflicted with a large number of weak stock. When this question is considered of such importance as to be treated with from a national economy point of view, it should be a complete answer to some who still advocate extended late hatchings to secure more food. At the present time, in this State, it is costing approximately 7s. per hen to feed laying stock, without calculating incidental expenses, labour, &c. It is more than questionable if the average late-hatched pullets will produce that value in eggs, seeing that they rarely lay before eggs are cheap, and can generally be depended upon to stop laying and to moult early; thus they only produce in the cheap season. Added to this is the high mortality in rearing, and the poor physique of the survivors.

Prohibiting the hatching of chickens during the months of October, November, and December would save hundreds of poultry-farmers from ruin, and hundreds of tons of food could be put to more profitable uses, not to mention the benefit that would accrue to the industry by the elimination of hundreds of thousands of physically unfit poultry, many of which, later on, are used as breeding stock. Right now is the time for the poultry-keeper to decide whether he will have early or late chickens.

Points in Artificial Incubation.

1. *Eggs.*—Fresh eggs, under a week old, and from physically strong stock, are necessary to ensure successful hatching.

2. *Housing.*—The incubator should be operated in a place free from draughts, and the room should not be over-ventilated. It is not a safe plan to operate an incubator in a dwelling-house.

3. *Sanitation.*—If the incubator is not new it should be disinfected and put in good sanitary condition.

4. *Operating.*—Before starting the incubator see that the regulating device is in perfect working order.

5. *Thermometer.*—Test the thermometer for accuracy, because, no matter how perfectly it may previously have been working, it is liable to get out of order at any time.

6. *Heating-up.*—Having lighted the lamp and secured a perfect burning light, get the temperature in the drawer up to 103 degrees Fah., and let it remain steady at that for a few hours before putting in the eggs.

7. *Filling the Drawer.*—Place the eggs in the tray, preferably with the large end slightly inclined upwards. The drawer may be filled or partially filled, but it is better full. It is not a good practice to put eggs in the machine on different dates, although with care in manipulation fair results are sometimes obtained by doing so. In such cases it is advisable to warm the eggs that are to be added before putting them into the machine, otherwise the temperature of the incubator will be affected, but in no case should fresh eggs be put in after the eighteenth day for those already in.

8. *Temperature.*—Bring the temperature in the incubator up to 102 degrees; this should be raised another degree as the hatch progresses. Between 102 and 103 degrees is the best temperature to run at, leaning to the high side towards the end of the hatch. When the first egg is seen to be chipped, which may occur on the nineteenth day if the eggs be fresh, let the temperature run up to 104 to 105 degrees until the hatch is finished. For these temperatures the bulb of the thermometer should stand just clear of the eggs; half an inch above is a good position.

9. *Turning.*—Commence to turn the eggs after they have been in the machine thirty-six hours, and turn them twice daily at least up to the ninth day; once per day afterwards is all that is absolutely necessary. Stop turning when the first egg is seen to be chipped.

10. *Testing.*—The eggs should be tested about the sixth day; even a novice can generally pick out the infertiles with a good tester at that time.

11. *Cooling.*—Commence cooling the eggs for a few minutes once per day after the sixth day, and gradually increase the time of cooling as the hatch progresses, first to ten minutes, then to fifteen, and up to twenty or even thirty minutes, according to the temperature of the room. But eggs should not be cooled for thirty minutes as a regular thing or too often.

12. *Ventilation.*—Little if any ventilation is required up to the time of commencing to cool about the sixth day. A graduated amount of ventilation may then be allowed up to the time the first egg is chipped, when the ventilators are better nearly closed. Most incubators are over-ventilated; as a matter of fact, very little fresh air is required in most makes of incubators, but in regard to this subject much will depend upon the construction of the particular machine in use.

13. *Moisture.*—In a well-made modern machine no moisture should be required. This matter, however, is of very little importance.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Albury.

A meeting of this branch was held on 18th April, Mr. J. Braun presiding.

The postion of Secretary, rendered vacant by the departure of Mr. N. L. Morton, was filled by the election of Mr. A. Buchhorn.

It was decided to make an application to the Agricultural Department for a winter pruning demonstration.

A resolution was passed to the effect that the branch viewed with satisfaction the action of the Government in establishing a fruit-case factory at Batlow, in an effort to supply orchardists with cases at a reasonable cost.

Mr. J. E. R. Fellowes gave a lecture on garden making, which proved of a practical nature, containing much valuable and varied information.

Bankstown.

A meeting was held on 22nd April, when a lecture was delivered by Mr. H. Wenholz, B.Sc. (Agr.), Inspector of Agriculture, on the production of sweet corn. Attention was specially directed to the area now devoted to this crop in America, and to the desirability of an increase in the area here.

Bimbaya.

At a meeting held on 27th April a paper was read by the Secretary (Mr. J. R. Boller) on the location of farm buildings, after which a lively discussion took place. Members generally were of opinion that the practice of erecting farm buildings without regard to convenience, &c., was hopelessly out of date, and that a modern dairyman, setting out to erect farm buildings, should aim at a central situation, permanent water supply, comfort, shelter, and convenience.

It was announced that a box of 47 volumes on agricultural subjects had been received from the Public Library, Sydney, for the use of members.

Cotta Walla.

At a meeting held on 25th March a paper was read by Mr. J. J. Wray on the horse bot-fly, from which the following is taken:—

THE HORSE BOT-FLY.

The bot-fly is about half an inch in length. When on the wing it appears to be of a light-brown colour, but a closer examination shows that it is covered with yellow and black hairs on the abdomen, and yellow only on the head. The male is shorter than the female fly; the abdomen of the female is long and pointed, and is always carried curled up beneath the body. When on the wing the bot-fly can easily be recognised by the peculiar humming noise it makes, which causes horses to be very restive, and sometimes makes it impossible to work them when a fly is about. The fly has no sting, and does not bite, yet horses seem to know by instinct that it is an enemy.

The flies lay their eggs on the hairs of the horses, beneath the jaws and behind the front legs being favourite places. The eggs are covered with sticky matter that causes them to stick fast to the hairs of the horse. They are dirty-white in colour, and about the size of a pin's head; the shape is that of an ordinary hen egg. These eggs get into the horse's mouth, being rubbed off into the chaff at the feeder, or licked off with the tongue. When the egg hatches in the horse's stomach, the little maggot attaches itself to the coating of the stomach by means of two little sharp hooks at the head and feeds there until properly developed, when it releases its hold and is carried through the horse and voided with the dung. The larva then burrows into the soil, and in warm weather the perfect fly is developed in about six weeks. The bot never makes holes in the stomach of the horse, and some men of experience contend that they do no harm and would not cause a beast to die; but it is generally recognised that when horses are badly infested they lose flesh and are weakened in constitution, and if another disease is contracted the horse's chances of recovery are lessened.

A number of drenches are recommended to expel the bots from the stomach, but none of them are very successful; the best, perhaps, is 2 oz. of turpentine and 20 oz. of linseed oil, given as a draught. To destroy the eggs, or to prevent them from being deposited on the hairs of the horse, is the best method of dealing with the pest. A mixture of kerosene and fat rubbed on the jaw and other parts of the horse that the fly favours is a good plan. The smell is distasteful to the fly, and the eggs will not stick to the greasy hairs. The eggs are easily noticed on a horse, and can be brushed off and destroyed.

DISCUSSION.—Nearly all the members present admitted they had believed that the bot-fly stung the horse when it deposited the egg. The best method of destroying the eggs, it was stated, was to singe the hair with a match or candle on parts of the horse where the eggs have been deposited.

At a meeting on 25th March, Mr. T. A. Howard read a paper giving an account of trials with wheat and oats conducted in the district by Messrs. Howard Bros. The report stated that the land—which grew oats the previous year—was deeply ploughed in February, spring-tooth cultivated in April, ploughed again in May, and sown and harrowed in the latter part of that month. The ground was very wet and sodden at sowing time, and during the winter large drains were scoured out by the rain, Cleveland wheat and Ruakura oats suffering most. Harrowed on 18th October, the plots made good growth in spring, and when harvested there was a good length of straw, and every appearance of good yields. However, the results were hardly so good as last year, though above the average for the district. The plots were treated at the rate of 64 lb. superphosphate per acre, except for one plot, which was left unmanured. The results may be briefly presented thus:—

Wheat.

	Per acre. bus.	lb.		Per acre. bus.	lb.
Marshall's No. 3	19	47	Cleveland	16	51
Yandilla King	19	27	Cleveland (acclimatised)...	16	40
Rymer	16	56	Cleveland (no manure) ...	13	6
Hard Federation	13	55			

Oats.

	Per acre. bus.	lb.
Algerian	33	34
Sunrise	24	25
Ruakura	22	31

Cunningham.

A meeting was held on 26th April, at which a general discussion took place on noxious weeds. It was realised that several weeds and thistles were taking hold of the fertile lands of the district, and a number were even unknown to members. Several methods were advocated for destroying various weeds, and it was eventually decided that a collection be made and brought to the next meeting, and that an officer of the Department be asked to attend to report on them.

An impromptu discussion of a useful kind on the best means of eradicating noxious plants took place at a meeting on 26th April. It was decided to ask the Department to arrange for an officer to visit the district, to give an address on the characteristics of various weeds, and also to arrange an experiment to illustrate different methods of ridding the soil of sorrel.

French's Forest.

The usual meeting of this branch on 20th April was well attended; one new member was enrolled. A paper was read by Mr. H. Buckley.

ARTIFICIAL INCUBATION.

Each year finds the poultry industry getting further and further away from the old methods; especially is this the case with incubation. The natural method of incubation has been superseded by incubators of all makes and sizes. Artificial incubation is not a new invention; it was in operation thousands of years ago in Egypt; it has been in operation in Germany, France, and England for nearly a century, and in America (which now produces more incubators than all other countries in the world) for about thirty years.

Many people, opponents of the method, state that the continuous use of incubators will cause degenerated stock and loss of vitality. The best answer to this is to study the egg-laying competitions, and to note the large totals piled up by birds coming from farms where incubators have been in use for years. It is a fact that many strains of White Leghorns are decreasing in size, but this may be due to forcing for heavy egg-production, and it should not be blamed on the incubator.

The chief advantages in using incubators are that the farmer can hatch chicks when required, he can work on a system (which he cannot do when he is at the mercy of broody hens), and he can rear a larger number with half the labour and cost, and the stock are quieter and easier to handle.

I can give no advice as to the special merits of different makes of incubators, but I prefer a machine that will give the greatest amount of fresh air in the egg chamber, while keeping up the required temperature; a glass door, so that the thermometer and the chicks can easily be seen without opening the machine, is also desirable. The capacity should be determined by the number of eggs that will be available for hatching in one week.

An underground cellar is considered the best place, but any substantial, draught-proof building, with ventilation at top and not too much iron about it, will do for incubation. I prefer a concrete floor. The machine must be level.

In keeping eggs for incubation, the position in which the eggs are placed has been the cause of a lot of discussion; some say large end down, others small end down. My opinion is that it does not matter what position the egg is in for the first five or six days, but if kept for a longer period large end down is best. Eggs for hatching should be properly stored, and not be subject to any violent changes of heat and cold, and they should be rested twenty-four hours after a road or rail journey.

No very large or very small eggs, or eggs with rough shells or ridges should be put down. They should be well shaped and of ordinary size. In the earlier stages of incubation the eggs are most delicate, and care should be taken at this time that they are not over-heated. Some authorities advise starting the temperature at 102 degrees, and raising it to 103 degrees towards the end of the hatch, but I believe in the general plan of 103 right through. From the third day the eggs should be turned morning and evening until the eighteenth day. They should also be cooled and aired every morning, beginning with a few minutes and increasing to half an hour towards the end of the hatch. The more exercise the germ gets the stronger is the chick and the readier to kick its way out of the shell.

Eggs should be tested for infertility on the eighth day and again on the twelfth, when all doubtful ones should be removed. At the eighth day fertile eggs will show a movable black spot with indistinct veins running about it. At the tenth or twelfth day they will be about two-thirds dark, with a light space on the top and bottom. Infertile eggs will show clear and transparent, while rotten eggs will show all dark.

I firmly believe in moisture trays, coupled, of course, with right ventilation. Authorities will tell you that the amount of moisture required should be regulated by the size of the air cell, but on examining the eggs there will be found such a variation that it is useless as a test. In applying moisture it is best to be guided by the maker's instructions. I believe a large percentage of what is called "dead-in-the-shell" is due to lack of moisture and bad ventilation. The chief causes of bad hatches are uneven temperatures, lack of moisture, eggs from poor stock, germs weak from various causes, bad storage of eggs, and eggs getting knocked prior to hatching. Dead-in-the-shell may be caused by any of the above.

The times of incubation are:—Hen eggs, 21 days; Runner ducks, 28 days; Muscovy ducks, 35 days; geese, 30 days; turkeys, 28 days.

DISCUSSION.—Mr. Lynch pointed out that a good incubator house, free from draughts, and of material that ensured an even temperature, was essential to good hatching.

DEPARTMENTAL NOTE.—The Poultry Expert does not agree with many of the views expressed by the writer of the paper. The question of artificial incubation is dealt with at considerable length in the Poultry Notes published in this issue.

Glenorie.

At a meeting of the members of this branch, held on 6th April, a paper was read by the Secretary, Mr. John Hutchinson, on citrus canker and the prohibition of importations. The disease was explained to the meeting, and the information given was very much appreciated.

At a meeting on 27th April a discussion took place on the advisability of procuring fertilisers early in the season, there being a probability of a shortage and high prices. An interesting paper was read by the chairman, Mr. F. A. Nicholson, on brown rot in stone fruit.

Holbrook.

A demonstration in timber clearing, which was a great success, was given by Mr. C. W. Burrows, Field Assistant, on 18th April. There were thirty-five members and others present, who all expressed themselves well pleased with the exhibition, and thoroughly convinced that time and money could be saved by the proper use of explosives. The timber picked out for the demonstration was the most difficult kind to deal with, but there was not a single hitch in the proceedings.

Matcham.

At a meeting on 20th April a discussion took place on the cultivation of the passion-fruit, and a paper was read by Mr. J. Anderson on hillside tillage.

Moruya.

A meeting of this branch was held at Mr. A. Louttit's farm on 17th April. Mr. H. Wenholz, B.Sc. (Agr.), Inspector of Agriculture, gave a lecture and field demonstration on the selection of seed maize.

Mr. Wenholz explained that if a proper selection of seed was not made a poor yield might go on for all time, but by using the seed from heavy-yielding plants a uniform high yield must eventually be obtained. Selection of the seed ear or cobs in the field was essential; the haphazard system of picking seed from the heap was not satisfactory.

Mr. Wenholz took those present through the crop, showing the proper ears to select for seed, and those that would not be suitable. Then, from a selection of ears, he explained the differences as indicated by the shape of the rows and general appearance. The cultivation and acclimatisation of maize were also dealt with exhaustively, and at the conclusion of a valuable address many questions were answered.

Nimbin.

At the monthly meeting, held on 27th April, a member asked was there any truth in the statement that cattle did better in the Big Scrub than at Nimbin. The Secretary stated that it all depended on the season. He had cut 1,000 lb. grass seed off a flat one season, when cattle were practically starving in the Big Scrub. Mr. Cullen thought the rainfall had a lot to do with it; grass on the flats became rank if there was too much rain, whereas the Big Scrub often required rain, and a wet season would suit that class of country.

Rawsonville.

The annual meeting of members of this branch was held on 24th April, when the officers for the ensuing year were elected. A short address was given by Mr. F. Sunderland on irrigation.

Spencer.

At a meeting on 20th April a paper was read by Mr. P. A. Edwards on agricultural shows. The paper pointed out the benefits to be derived from agricultural shows, including their educational and commercial advantages. The paper was followed by a general discussion, several members speaking on the subject.

Springside.

At a meeting of members of this branch, on 26th March, a paper was read by Mr. T. C. Bowen on the hay wheats suitable for the district. Mr. Bowen advocated the use of the very latest varieties, because those maturing early were apt to be damaged by late frosts and light falls of snow when the plants were coming into head, and also by cold rains when in blossom, which checked the growth, if it did not permanently injure the plants. The advantages of late-maturing varieties were that they were not advanced enough to receive a check from the abovementioned causes, and the later stages of their growth were made when everything was favourable, such as warmth. The heaviest yield of hay was from White Tuscan; heavy crops were also yielded by White Hogan, Tarragon, Genoa, Cleveland, and Zealand; one season a heavy crop was obtained from Bobs. Mr. Bowen's favourite variety, however, was Zealand; it stood up well, was fairly free from bunt and rust, carried a darker green colour than any other variety, and had not the objectionable white butts. The best time for cutting hay was as soon after blossoming as weather would permit; this ensured full weight of sap and a good colour, which were essential in wheaten hay. The members were warned to beware of big stooks if they hoped to produce hay that would top the market.

Tingha.

This branch held an exhibition of produce, &c. (the first for the district), on 23rd March, and attracted a large number of people from considerable distances. Fruit and vegetables of excellent quality, especially as the season had been a dry one, flowers, jams, jellies, poultry, needlework, &c., went to make up a display that surprised even the promoters of the event. The Inverell branch of the Bureau lent their aid, and several members from that centre acted as judges, expressing much satisfaction with the quality of the exhibits, their number, and variety.

Toronto.

The monthly meeting was held on 7th May, when there was a good attendance. A discussion took place on live stock.

Mr. Froome dealt briefly with pigs, recommending Middle Yorkshires and Berkshires for porkers, and Berkshire or Middle Yorkshire sows crossed with Tamworth boars for bacon.

Dealing with the dairy stock in the district, Mr. Froome stated that the Jerseys were disappointing after having seen the breed in their native land. Attention was drawn to the fact that stock sometimes took prizes in the shows, though they had broken colour. Jerseys were supposed to be more delicate than other breeds, but he had not found this true. It was time, he thought, that the Department of Agriculture did something for the improvement of dairy stock in this State. While farmers and dairymen were allowed to run mongrel bulls with their herds, there was no prospect of improving our dairy stock, and the Government should make it compulsory to register all bulls over 6 months old, and should only allow purebreds to be kept, with a heavy penalty for failure to comply. Dairying in this State was a vast industry, and by improving the stock the yield would be found to greatly increase. It was very disheartening when one man was endeavouring to improve his stock, while his neighbour was satisfied to rub along with very poor sorts indeed. He felt sure that if some branches of the Bureau would take the matter in hand, their labours would not be in vain.

DEPARTMENTAL NOTE.—The Herdmaster states that in the Island of Jersey a large percentage of the prize-winners (production as well as purely inspection classes) are of broken colours. This is also true of the breed in England. The champion Jersey bull at the Royal Agricultural Society's Show, 1918, is a broken-coloured bull, and he had an unbeaten record in England prior to his export to Australia. The Jersey breed in Australia has a tendency to grow into stronger and plainer animals than the Channel Island specimens. This is due largely to climatic conditions. The record of Mr. C. R. G. McDonald's cow Brighton Vanilla, is interesting as regards quantity of milk yielded. The question of compulsion in regard to the sires kept in herds would require special legislation.

Valla.

At a meeting of members of this branch, held on 15th April, a discussion took place in regard to the different grasses introduced into the district, and, after a lengthy debate, in which a majority of the members took part, the general opinion seemed to favour *Paspalum dilatatum*, clover, and Rhodes grass. Several members had experimented with other grasses, but had not been very successful.

One member spoke well of *Paspalum compressum* as a cream-producer, while others had tried with success *Paspalum virgatum* and *Phalaris bulbosa*. *Chloris barbata* was found to be a failure on account of frosts.

A meeting was also held on 6th May, when a discussion took place on the most suitable breed of cattle for the district.

Mr. CAMERON favoured Ayrshires; he had a number, and found their period of lactation was a long one, and he wished for nothing better as cream producers.

Mr. STEELE'S choice was an Ayrshire-Durham cross. The stock produced by this cross were not only good dairy cows, but were growthy sorts of good colour, the steers commanding a good price in the open market.

Mr. HENDERSON also favoured the Ayrshire-Durham cross.

Mr. COLEMAN spoke strongly for the Jersey breed for hilly country. Being light they were good climbers, and their milk tests were high, producing more butter-fat per lb. of milk than any other breed; they were hardy and moderate feeders. He quoted figures showing the relative value in butter-fat of 200 lb. of milk according to test.

Mr. Wyatt considered the Illawarra cow was the best under local conditions; he had six of this breed and regarded them as the best in his herd.

Mr. Reynolds favoured Jersey crossed with Durham or Ayrshire. They made splendid cream producers, hardy and docile.

Mr. Tutt also considered the Jersey crossed with Ayrshire or Durham was the best for local conditions.

In reply to the question at what age was a cow at her best as a cream producer, Mr. Coleman said that all the champions put up their records at about 12 years old.

Windsor.

This branch met on 26th April, when a paper was read by Mr. W. Smith, from which the following paragraphs are taken:—

Citrus Culture.

The first consideration when contemplating citrus growing is the selection of a suitable site. This should be on a gentle slope and fairly high, where the frosts will not be too severe. Citrus fruit is not limited to one particular class of soil, and I do not consider it absolutely necessary for the soil to be very rich; in fact, I think that some of the poorer soils will produce fruit far better in appearance and quality, and with thinner skin, than will the richer and heavier soils, providing proper attention is given from time to time. An easterly aspect is usually recommended, but I consider this immaterial so long as provision is made in the shape of wind-breaks. This is most important in exposed situations. A double row of *Pinus insignis* or a belt of native timber, say a chain wide, will form an effective wind-break.

In new country the first thing to do in preparing the ground is to have the timber ringbarked. This will be found very beneficial for several reasons. In the first place there will most probably be an abundant growth of grass, which, combined with the leaves and bark from the trees after ringing, is returned to the soil, and has the effect of keeping it loose and friable for a considerable time. Another advantage of ringbarking is that the timber is killed, and stumps and timber may be more readily burnt out, the soil benefiting by the potash contained in the wood-ashes.

Fungus diseases which are found in bush timber, which may attack the roots of the fruit trees, will be destroyed by thorough clearing. Every operation should be done thoroughly; grubbing should be carried out to a depth of at least 9 inches, and all roots should be removed. Two ploughings are preferable to one. The first one should be shallow, about 3 inches deep, and all leaves and rubbish should be turned under and left so for about three months to allow of decomposition. Near planting time the land should be harrowed down, and then ploughed, say, 6 or 7 inches deep; the class of soil will govern the depth. Under no circumstances should a lot of inferior subsoil be brought to the surface. The second ploughing should be harrowed down immediately, and everything is then ready for planting the young trees. It is a common practice to dig deeper where the tree is to be planted, but that is objectionable, because the hole may hold water and cause injury to the roots of the young tree. The next operation is to stake out for planting. First, obtain an adequate supply of suitable stakes, preferably split ironbark or other hardwood, 2 feet 6 inches in length and from 2 inches to 2½ inches square. To save unnecessary travelling and expedite the work, three men should do the staking out. First, run a line of stakes around the outside of the ground 20 feet from the fence and 20 feet apart; and then run a line of stakes through the centre both ways; place a man to sight each way to keep the line true, and the remaining stakes can then be filled in. Care should be taken to keep a straight line at any angle.

Discussion.—Mr. T. W. Mitchell said the ploughing to a depth of 3 inches, followed by a deeper ploughing in two months' time, was not satisfactory. The first ploughing should be deep, so that the soil brought to the surface could sweeten before breaking down and planting.

Mr. Smith said that the soil he referred to was poor and the subsoil retentive, so that the shallow ploughing had the effect of allowing the deeper ploughing to be carried out more easily.

Mr. Spinks said that a rule the intending orchardist was over-anxious to get his orchard planted out, and did not prepare the soil sufficiently before planting. He agreed with Mr. Mitchell that the first ploughing should be deep; but in poor soils, the subsoil should not be brought to the surface, but rather a plough with the mouldboard removed or a subsoiler should follow the furrow of the mouldboard plough to a good depth. It was always very necessary to attend to the proper drainage. Moist situations and soils required drains 3 feet deep and covered, also proper surface drains.

Woonona.

A paper on onion culture was read by Mr. E. Thomas at a meeting of the above branch on 15th April. The following notes are from the paper:—

ONION CULTURE.

It is essential that for successful onion growing the land should be well drained and deeply dug and worked until a fine tilth is obtained. My experience on badly-drained soils has been far from encouraging. It is an advantage if the land is got ready as early as possible, so that, in the event of small weeds making an appearance, the hoe can be worked over the surface. This will save much subsequent labour on weeding. The soil should be well worked with both fork and rake prior to sowing, so as to ensure the seed being sown at a proper depth. I have used poultry-yard manure on the crop, and have always had good results.

The best time to sow the seed is on a fine day when the soil is nice and workable. To sow seed on a wet seed-bed would cause a hard surface, which would be disastrous to the seedlings. The seed should be sown from ¼ to ½ inch deep, according to the amount of moisture in the soil, and in drills 6 or 7 inches apart. The seedlings are then much easier to hoe and weed than when broadcasted. Some shelter should be provided from cold winds; a few rows of peas or beans on the weather side of the bed will suffice. The time for sowing may vary a week or so, according to soil and weather. I have sown about the middle of May; but this year I sowed on 13th April, although any time till the end of May will do. Let good, reliable seed be the first consideration, and let the soil be nice and firm.

There are three methods of growing onions, viz., sowing broadcast, allowing the seedlings to remain in the seed-bed and thinning out to about 9 inches apart, and transplanting. From my experience the other two methods are nowhere compared with the transplanting method, as to both weight and uniformity of bulb. The plants should not be hurried from the seed-bed to their permanent quarters if the weather is cold or windy. It is a mistake to think that the earliest transplanted seedlings are going to make the largest bulbs. The middle of August or the first week in September is quite early enough on the South Coast, and is likely to be much more successful in obtaining a good even plant. To plant in rows 12 inches apart and from 9 inches to 12 inches between the plants will leave nice room for using the hoe between the plants, and will relieve the grower of much hand-weeding. In planting out, use a small dibber, and plant rather deeper than they were in the seed-bed. Always have a good firm surface for both seeds and plants.

The time of harvesting the crop varies according to the season, but generally it is about January to February. Some growers bend the tops over to hasten the ripening, but given fine weather nature takes its own course. When the tops are turning yellow it is advisable to pull them up, and allow them to mature somewhere handy to the homestead. In the event of rain the bulbs left out should be covered. If harvested in wet weather the bulbs very rarely keep well.

In answer to a question on the use of poultry manure, Mr. Thomas replied that he did not use fresh manure, but left it in a dry shed for four to six weeks, and then applied it evenly over the surface of the beds.

Yarramalong.

At a meeting on 4th May the Secretary, Mr. L. Hodges, tendered his resignation, which was accepted with regret. Mr. Ernest Hodges was appointed to the vacancy.

Orchard Notes.

JUNE.

W. J. ALLEN.

Selection of Varieties.

THERE are two main principles which must be kept in mind when this work is being undertaken. First, select only varieties which suit the district in every detail; second, select only varieties for which there is a ready sale at payable prices, or which can be turned into a profitable product. With regard to the first point, the most satisfactory method is to consult growers with long experience in the district, and note under what conditions they are producing the varieties they recommend. The latter precaution is very necessary, as it must be remembered that soil and other conditions will often vary widely in the same district. The second principle is equally important, and is, if anything, more difficult. For instance, varieties that are hardy, consistent croppers and good sellers become popular amongst the growers, and danger of over-production ensues. The preference of the buyer will change from various causes, and the demand for a certain variety or class of fruit will slacken.

Directions for the general lay-out of an orchard, including the disposition of retaining drains and windbreaks, will be found in the Orchard Notes published in the *Agricultural Gazette* for June, 1917.

Distance of Planting.

The distance apart at which the trees should be planted is, to some extent, governed by the rainfall of the locality. Greater distance must be given in districts with a low rainfall, in order to allow a larger area for each tree from which to draw its supply of moisture. In rich soil, where trees will grow to a great size, more room must also be given them, notwithstanding that the rainfall might be ample.

The following are the usual distances at which trees are planted on the square and hexagonal systems:—

Distance apart.	Trees per acre.	
	Square system.	Hexagonal system.
feet.		
20	108	125
21	99	114
22	90	103
23	82	94
24	75	86
25	70	80

Following are the distances at which vines are usually planted, and the number of same per acre:—

Distance apart.	No. of Vines.
6 feet x 6 feet	1,210
6 ,, x 8 ,,	907
6 ,, x 10 ,,	726
8 ,, x 8 ,,	680
8 ,, x 10 ,,	544
10 ,, x 10 ,,	435
10 ,, x 12 ,,	363

In order to arrive at the number of trees or plants required to plant an acre of land, the following method is adopted:—

> Reduce 1 acre to square feet = 43,560 square feet; divide this by the square of the distance apart at which the trees or plants are to be planted.

The above gives the number of trees or plants per acre on the square system. Fifteen per cent. is added to this when planting on the hexagonal system.

In inland districts where irrigation is practised, vines are usually planted at a distance of from 8 ft. x 8 ft. to 10 ft. x 10 ft. In the inland districts where irrigation is not practised, the distance is from 10 ft. x 10 ft. to 10 ft. x 12 ft. In the coastal districts a greater distance is now generally given between the vines than was formerly the case, 6 ft. x 6 ft. to 6 ft. x 8 ft. for staked vines, and 6 ft. x 8 ft. to 6 ft. x 10 ft. for trellised vines being the usual distance for planting. When the vines are to be trellised, the greater distance should be allowed between the rows, as this is more convenient for working, and also saves material and labour in erecting the trellis.

Planting.

If the soil is in good moist condition, the present month is a good time for planting deciduous trees and grape vines. Planting, however, should not be attempted if the soil is very wet, especially in heavy soils, or if the soil is in a very dry condition. Before planting the trees, all damaged roots should be cut back to sound tissue. When carrying the trees to the places at which they are to be planted, the roots should be kept covered with a damp bag, so that they will not become dried by the sun or wind. The centre of the hole should be kept high, which facilitates the spreading of the roots and gives them a downward tendency. In filling, use moist fine surface soil, which will work in around the roots; this should be well pressed down with the foot, so that it may come in close contact with the roots. When all the trees are planted they should be cut well back, starting the head or crown of the tree from 15 to 18 inches from the ground. A great proportion of the roots which have supported the top of the tree the previous season in the nursery has been lost in transplanting; moreover, what are left take some time to become established, and consequently the tree will start far more vigorously if cut back heavily at planting, and generally will outgrow a tree which is not so treated.

Pruning.

The pruning of deciduous trees should be continued this month, dealing first with those which start out first in the spring, such as apricots, Japanese plums, and peaches, leaving pears and apples till last.

Whilst pruning keep a sharp look-out for scale or other pests, and mark such trees, also any weak trees, for special treatment. A new edition of the "Pruning" handbook is now available, price 1s. 1d., post free, from the Government Printer, Sydney.

Orchard Burners.

It is surprising how few deciduous fruit-growers have adopted burners for disposing of the prunings. An effective burner can be made very cheaply by placing a square iron tank (one discarded as useless for holding water will do) on an iron framework and wheels. The framework is simple, and can be made by any blacksmith, or even by a handy man; the iron wheels can generally be obtained from a blacksmith or foundry scrap heap. The bottom of the tank should be freely pierced with 1-inch or 1½-inch holes to allow for sufficient draught to make a quick-consuming fire. The advantages of a burner are many. It is quicker, and therefore cheaper, than carting away the prunings; it is better for the land than drawing a loaded cart through the orchard. The prunings are destroyed by fire on the spot, together with any missed fruit; and should they be affected with any insect pest or fungus disease, the danger of spreading same to any other part of the orchard is lessened. In districts where heavy frosts occur, pruning for the first hour or so after sunrise is very painful for the hands, and it is almost impossible to keep one's mind solely on the job, and to do good and quick work, whereas the time might be very profitably used in burning off the previous days's prunings.

Spraying.

Deciduous trees that blossom early, such as Bell's November and Edward VII peaches, should receive an application of winter strength lime-sulphur or Bordeaux mixture this month. Bulletin No. 72, "Spraying," gives full particulars of the various sprays, and includes a spraying calendar for fruit trees. It may be obtained free by residents of New South Wales on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Harvesting.

Where oranges are coloured and of sufficient size, and where trees are carrying heavy crops and prices will warrant it, it is a good plan to make pickings of the best-coloured and largest fruit. This lessens the strain on heavily-laden trees, and also distributes the labour of harvesting over a longer period.

CLEARING LAND AND SUBSOILING WITH EXPLOSIVES.

A LIMITED number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Field Assistant, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
Annual Sheep Show (conducted by a Joint Committee of the R.A.S. and N.S.W. Sheep Breeders' Association).	H. M. Somer ...	June 27, 28, 29
National A. and I. Assn. of Queensland (Brisbane)...	J. Bain	Aug. 12–17
Trundle P. and A. Association	W. E. Herborn ...	,, 13, 14
Corowa P., A., and H. Society...	J. D. Fraser ...	,, 20, 21
Parkes P., A., and H. Association	G. W. Seaborn ...	,, 21, 22
Murrumbidgee P. and A. Association (Wagga) ...	A. F. D. White ...	,, 27, 28, 29
Forbes P., A., and H. Association	J. H. Bates ...	Sept. 3, 4
Grenfell P., A., and H. Association	G. Cousins ...	,, 3, 4
Ganmain A. and P. Association	T. S. Henderson...	,, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 10, 11, 12
Young P. and A. Association	T. A. Tester ...	,, 10, 11, 12
Cowra P., A., and H. Association	E. W. Warren ...	,, 17, 18
Culcairn P., A., H., and I. Society	J. B. Ryan ...	,, 17, 18
Temora P., A., H., and I. Association	A. D. Ness ...	,, 17, 18, 19
Holbrook P., A., and H. Society	J. S. Stewart ...	,, 19, 20
Henty P. and A. Society	H. L. Yates ...	,, 24, 25
Murrumburrah P., A., and I. Association	J. A. Foley ...	,, 24, 25
Yass P. and A. Association	E. A. Hickey ...	,, 26, 27
Narromine A. H. and P. Society	C. E. Skinner ...	Oct. 1, 2
Junee P., A., and I. Association	T. C. Humphreys..	,, 1, 2
Ardlethan and District P. and A. Society	W. J. Nixon ...	,, 2
Eugowra P., A., and H. Association	R. A. Douglas ...	,, 2
Deniliquin P. and A. Society	P. Fagan	,, 2
Hay P. and A. Association	G. S. Camden ...	,, 9, 10
Lismore A. and P. Society	H. Pritchard ...	Nov. 20, 21

1919.

Albion Park A., H., and I. Association	H. G. Fraser ...	Jan. 15, 16
Kiama Agricultural Society	G. A. Somerville...	,, 25, 27
Shoalhaven A. and H. Association (Nowra)	H. Rauch ...	Feb. 13, 14
Southern New England P. and A. Association (Uralla)	H. W. Vincent ...	,, 25, 26, 27
Inverell P. and A. Association	J. T. Dale ...	,, 25, 26, 27
Tenterfield P., A., and M. Society	R. S. Smith ...	Mar. 4, 5, 6
P. and A. Assn. of Central New England (Glen Innes)	G. A. Priest ...	,, 11, 12, 13
Armidale and New England P., A., and H. Assocn....	A. McArthur ...	,, 18, 19, 20, 21
Quirindi District P., A., and H. Association	A. Pountney ...	April 2, 3, 4
Moree P. and A. Society	A. U. Ezzy ...	May 21, 22, 23

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VOL. XXIX. PART 7. JULY 2. 1918

Agricultural Gazette of New South Wales.

The Cultivation of Maize.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

Preparation of the Soil.

It is for maize perhaps more than for any other crop that the initial fitting or preparation of the soil is so largely neglected, and yet it is this crop which responds so readily to good treatment in this respect, for, given the usual time of planting, good soil conditions mean immediate germination and vigorous seedlings, both of which have a substantial effect on the subsequent yield. The chief requirements of a soil for the growth of maize are sufficient moisture and plant food material, and these are considerably increased by a thorough preparation of the soil.

In most of our maize-growing districts, the conditions are such that the ensuring of sufficient moisture is the main consideration. We have witnessed in the history of wheat-growing in this State an increase in appreciation of the importance and utility of a twelve months' fallow period to conserve moisture, but there has not yet been fully realised in some districts the importance of a four or five months' winter fallow for maize, especially where the rainfall during the growth of the crop is insufficient for its requirements or where that rainfall cannot be depended upon. We see too often the spectacle of calm resignation at the comparative failure of the maize crop during a dry season. The amount of moisture which can be stored for the maize crop during a winter fallow has been seriously overlooked in many districts.

The effect of good preparation in the "unlocking" or rendering available of the large stores of plant food material which exist in most maize soils is also worth consideration. Much of this food material for the plant must be brought into a condition in which it becomes easily soluble in the soil moisture, and immediately available as plant food for the young seedlings. The most vigorous young maize plants have an immense advantage, no matter what the conditions of after-growth may be.

It is becoming more widely recognised that "well prepared is half cultivated"; in other words, that no amount of after-cultivation can make up for insufficient preparation of the soil.

Ploughing in *v.* Burning Stalks.

Where maize is grown on the same land for a number of years, as on the rich alluvial flats of many of our coastal rivers, it is sometimes a debatable question whether the old stalks should be burnt or ploughed in. The chief objection to ploughing in the stalks is that they do not rot quickly enough, and they therefore interfere with the planting and cultivation of the following crop. Particularly is this the case on the North Coast where heavy growths of stalk are produced, and where the winter is comparatively dry. The use of the furrow-opener in front of the maize drill largely eliminates the trouble with the rubbish at planting, but the presence of bits of old stalks mostly precludes the use of the harrow or of the cultivator close to the young plants, owing to the danger of dragging them out. If the first ploughing is left until spring, there is practically no alternative but to cut and rake up the stalks and burn them in heaps. For raking into heaps or windrows the ordinary lucerne or hay rake can be used, or a long-tined harrow. Sometimes a heavy wooden rake is made at home for the purpose.

The advantages of burning the stalks are :—

1. Destruction of numerous insect pests, especially those which pupate in the stalk.
2. Killing of spores of fungus diseases, such as smut, dry rot, &c.
3. Destruction of the weevils' food supply and shelter which, if left, serves as a means of carrying many weevils in various stages through the winter.
4. Freeing the ground of rubbish which interferes with the planting and cultivation of the subsequent crop.

The chief objections to burning the old stalks are :—

1. The extra trouble and labour involved.
2. The destruction of organic matter, which it is of vast importance to conserve on most of our maize soils.

These objections can perhaps be overcome, firstly, by the fact that the extra work comes at a time (*i.e.*, late autumn or early winter) when labour is not particularly busy ; and, secondly, by the growing of catch or cover crops (especially legumes, such as cowpeas, field peas or vetches) for ploughing in as green manure. Where a catch crop is grown between the rows of maize for this purpose, it will usually be found that by proper treatment the green manure can be utilised to aid considerably in decomposing the stalks. A cover crop, such as field peas or vetches, sown on the land after burning the old stalks of an early maturing variety, is, however, easily practicable in many districts.

The chief advantage of ploughing in the old stalks is, of course, the addition of organic matter, which, it cannot be denied, is of considerable value in the case of those soils that have become impoverished in this constituent, and that therefore are deficient in water-holding capacity. When the stalks are to be ploughed in, the operation may be satisfactorily carried out, in some cases by the direct use of the disc plough alone. In most cases, however, the stalks are first cut up by the disc harrow or by a chopping roller specially made for the purpose. The advantage of the latter is that it is only of light draught (needing but a single horse), and that it can be driven by a boy quite easily. It does not work well, however, if the ground is soft and loose.

Ploughing.

The initial ploughing is the most important operation in the preparation of the soil, and on its thoroughness depends to a large extent the yield of the subsequent crop.

Under most conditions this first ploughing should take place in the autumn or early winter. Land ploughed at this time and left in the rough state during the winter is greatly benefited by the mellowing action of frosts, and is open to receive the winter rains, both of which penetrate more deeply into the soil and subsoil. This, with the greater aeration of the soil, materially improves the chemical and physical character of the soil, especially if the ploughing be deep and thorough.

Where undulating land is left unploughed during the winter, much of the rainfall is lost by running off the hard surface. Most of this could be conserved if the land were deeply ploughed and left rough. On hillsides and where the winter rains are excessive, it may be found advisable to plough the land in autumn and plant a cover crop like peas, clover or rape to cover the ground during the winter and prevent erosion of the soil. In all cases where hillside land is cultivated it is preferable to plough and plant across the slope of the hills, in order to save the soil from washing. This should be observed particularly on some of the South Coast slopes which are used for maize growing, viz., at Milton and Tilba, where too much up and down hill ploughing and planting is to be seen.

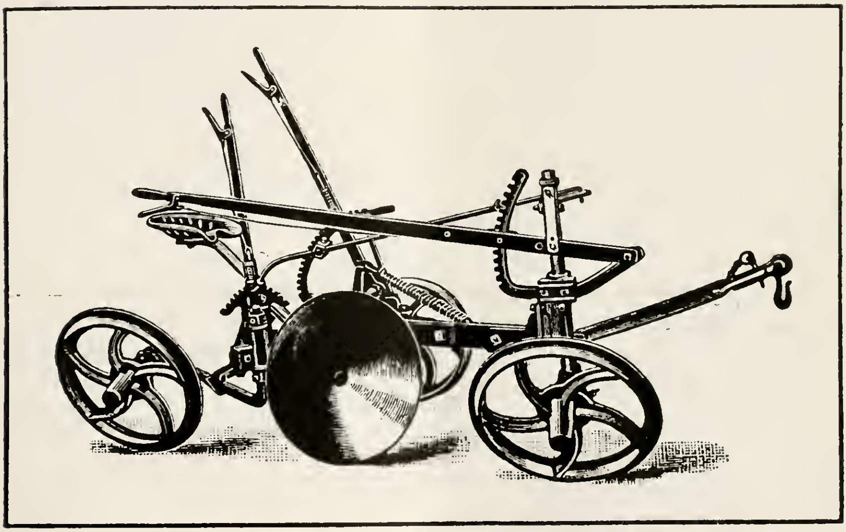

Fig. 1.—Single-furrow Disc Plough. Rapidly becoming popular for the deep ploughing of maize land on the Coast.

On flat lands that drain poorly, recourse may often be had to ploughing the ground in narrow strips about 8 feet or 12 feet wide, on which two or three rows of maize are planted, with a "dead" furrow or open drain between each strip to carry off the surplus moisture.

Time of First Ploughing.

Much of our maize land is still left unploughed during the winter months, although almost all reason is against the practice. It is almost an invariable rule that, other things being equal, the land that has been given the longest preparation or fallow gives the best return.

Although it is generally agreed that there is an optimum condition of the soil for ploughing, it is not always possible to get this condition in actual practice. There is more to be lost by ploughing land too wet than too dry, especially in the autumn. Ploughing in the spring land that is dry only results in still further drying, no matter what precautions are taken. The danger is then that there will not be sufficient moisture in the soil at planting time. This has often been observed on the North Coast, where comparatively dry winters and dry springs are the rule rather than the exception. Even where land is too dry when ploughed in the autumn, it is surprising how it may be brought into good condition, and moisture conserved, notwithstanding a small winter rainfall. On hillsides it is a distinct advantage to plough land when dry, as it breaks up more roughly and erosion is thereby reduced. The condition of the land is probably of more importance in the case of slopes than the actual time of ploughing, though the danger of getting too dry a soil if the ploughing is left till spring should be borne in mind. After all, in this case the deciding factor is perhaps the amount of winter rainfall.

Where a catch crop has been sown between the rows of the previous crop of maize, it is advisable to plough the land in the early winter, as it will usually be found that the soil has been dried out to some depth, and requires the whole of the winter rains to restore its moisture.

An autumn or early winter ploughing is more essential still in the case of lucerne land, for this reason. It is well known that maize which follows lucerne must have plenty of moisture, and the best way to ensure it is to save every possible drop of winter rainfall.

In every instance, it will be found advisable to plough grass or sod land in the autumn or winter, not only to give a longer time for the grass to rot, but also to destroy white grubs, which are usually present in large numbers in old pastures.

Autumn ploughing of old maize fields also helps to kill cutworms and ear-worms that otherwise would survive the winter in the pupal stage. Birds pick up many of these after the plough, while many more are killed by the plough, or are buried too deeply.

Sandy soils are more liable to suffer loss of fertility by leaching than clay soils in districts of heavy winter rainfall, and where a cover crop is to be sown to prevent this, vetches will usually do better than field peas. If a cover crop is not sown, ploughing can with advantage be left till later in the winter.

Heavy clay soils that are ploughed in the autumn may run together again or become so compact during the winter as to necessitate a second ploughing. Where this happens it is advisable to replough, for under all circumstances it is better to keep the soil open until the end of winter. Much of this trouble can, however, be avoided by ploughing up rough and dry with the first ploughing. Where sufficient rainfall can be expected to compact these heavy soils two or three times during the winter, it will be advisable to resort to a winter cover crop.

Under most conditions autumn or winter ploughing will need to be followed by a spring ploughing.

Spring Ploughing.

In most cases spring ploughing is an operation that cannot be omitted. Even where the land has received a good winter ploughing, a spring ploughing will usually be found necessary, especially where the soil is of a heavy nature and has become compacted by winter rains, though, of course, deep thorough ploughing is neither essential nor advisable in this instance.

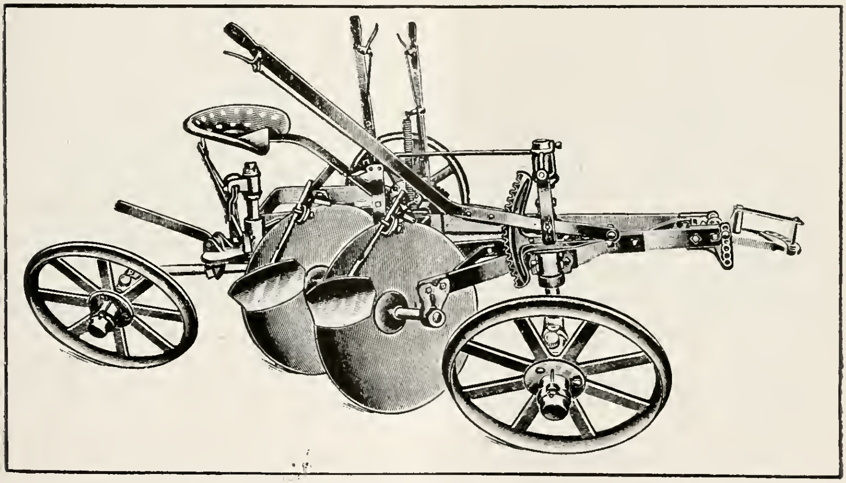

Fig. 2.—A Double-furrow Disc Plough. A type gaining favour on the Coast.

As a general rule the spring ploughing should not be deeper than 4 or 5 inches, and the shorter the time between this ploughing and planting the shallower should be the working. It must be remembered that, especially after a good winter ploughing, it is the surface soil which is richest in plant food material, most free from acidity, and with the greatest warmth and aeration, so that it is essential to keep this soil near the surface in order to produce good germination and vigorous seedlings.

Further, there is a danger when the spring ploughing is too deep, or when planting follows too closely upon it, that there is not sufficient firmness of the soil for the delicate roots to come in contact with the soil particles from which they draw the dissolved plant food.

It is essential that the spring ploughing should be done as far as possible at a time when the soil is in the best condition for it, *i.e.*, neither too wet nor too dry, for much extra discing and harrowing is saved thereby in the preparation of a good seed-bed. Large clods are not desirable from the spring ploughing, on account of the trouble usually experienced in breaking them down. They are most effectively avoided by a previous deep autumn or winter ploughing and by a shallow spring ploughing.

In districts of heavy winter rainfall where it is considered advisable to have the ground covered with a crop of peas or clover grown between the rows of maize to prevent leaching of fertility or erosion of the soil, the first ploughing can with advantage be left till early spring, and the whole mass ploughed in at least five or six weeks before planting time. If left too long in the spring, it will be found that the growth of this crop or of weeds dries out the soil considerably.

Where a heavy growth of vegetable matter is ploughed under in the spring and the soil is inclined to be dry, rolling after ploughing is the best treatment to adopt in order to ensure a sufficiently firm contact of the soil and the organic matter to decompose the latter quickly. This is especially the case on sandy loams which do not settle down quickly, or on clay loams which break up lumpy. Usually there is a rush of work in spring, and if the ground has been previously ploughed a much larger area can be covered with a skim or shallow ploughing, for light multiple ploughs (two or three furrows) can be used with advantage for the work.

The spring ploughing should not be left much later than early spring, especially where the conservation of moisture is a factor to be considered, for with the advent of spring the evaporation of moisture from the surface of the soil becomes greater day by day. Spring ploughing should be followed by the harrow to create a mulch to conserve this moisture. In these days of shortage of labour and high cost of production it would be a good idea to attach a leaf of the tine harrow to the disc plough, and to work the soil down at one operation.

The Kind of Plough.

It is often a matter of some contention as to which plough should be used—the disc or the mouldboard. The latter always leaves a rougher surface, and is therefore the best to use for an autumn ploughing, or for a heavy loam which is inclined to run together. The disc plough breaks up the furrow slice more, and is the most suitable kind for the spring ploughing. There has been a distinct tendency on the coast during the last few years to favour the disc plough even for the first ploughing, and it is thought that it is not much inferior to the mouldboard in many ways, especially when the depth goes to 12 or 15 inches on deep soils. On heavy shallow soils, only about 6 or 8 inches in depth, the continued use of a disc plough will soon create a hard-pan which is extremely detrimental to the growth of the crop. It seems likely that bad cases of lodging are also attributable to such conditions. The disc plough will, however, deal effectively with any green manure growth, weeds or old maize stalks which it is desired to bury. The best type of disc plough for this purpose is one with a high clearance. The disc plough will also plough hard and dry ground that the mouldboard will not "look at."

It is becoming increasingly evident that it pays better to use large, heavy ploughs and plenty of power, especially for the first ploughing. A favourite practice is to remove one of the discs from a 2-furrow disc plough, and do the first ploughing with one disc, and to use both discs for the spring ploughing.

For breaking paspalum ground the mouldboard is essential, and it should be of a type which will take a wide shallow furrow and completely invert the furrow slice. A crop of broadcast oats, maize, or sorghum, according to the season, keeps the ground clean.

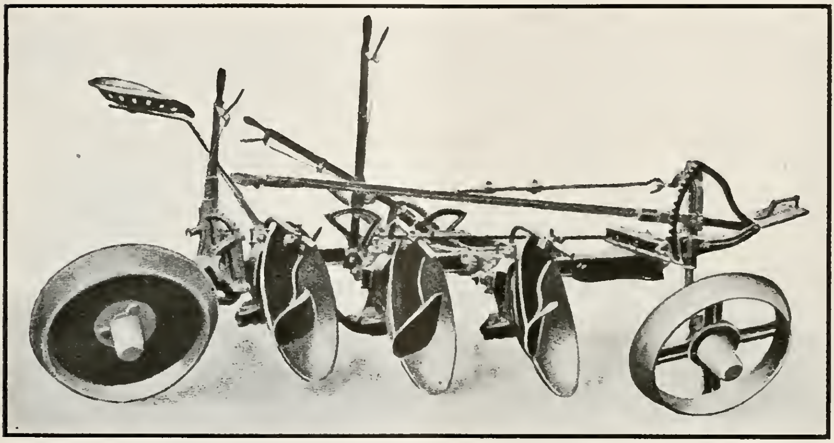

Fig. 3.—A Three-furrow Disc Plough. Suitable for larger areas.

Depth of Ploughing.

Deep ploughing is almost universally recommended for maize. At least, it is everywhere agreed that a deeper ploughing is essential for the best results with maize than for the other cereals (wheat, oats, &c.). The kind of soil on which maize is usually grown as compared with wheat is of course partly responsible for this difference, for most of the maize soils in this State are of alluvial or volcanic formation, and of much greater depth than the wheat soils. But maize is a gross feeder compared with wheat, and by far the greater proportion of its feeding roots exist in the surface soil, so that the deeper the soil is ploughed and sweetened by aeration the better.

The nature and depth of the soil determine the depth of ploughing to a large extent. On many alluvial and volcanic soils where profitable crops of maize are grown, clay subsoil is encountered at a depth of 6 or 7 inches. Where the ploughing is made to about the same depth each year a hard-pan is formed which eventually becomes so stiff that roots and moisture only penetrate it with difficulty. To avoid this condition such land should be ploughed a little deeper each year—say 5, 6, 7 and 8 inches successively—and then back to a depth of 5 inches for one year. It is not advisable to bring up a large amount of sour clay subsoil to the surface at once, but if the ploughing is done early in autumn, winter frosts will mellow a little subsoil down into fairly friable soil by spring. This is especially the case where the subsoil contains a fair amount of lime, as on the Murrumbidgee Irrigation Area, or where lime is applied to the soil after ploughing.

Deep sandy loams can be ploughed from 12 to 15 or 18 inches deep in the autumn without any trouble; but these soils should not be ploughed deeply in spring, as they take much longer to settle down sufficiently in time for the young roots of the maize plants. In fact, after a deep spring ploughing of any soil, a thorough discing, harrowing, and even rolling is necessary in order to unite the ploughed portion with the "plough sole."

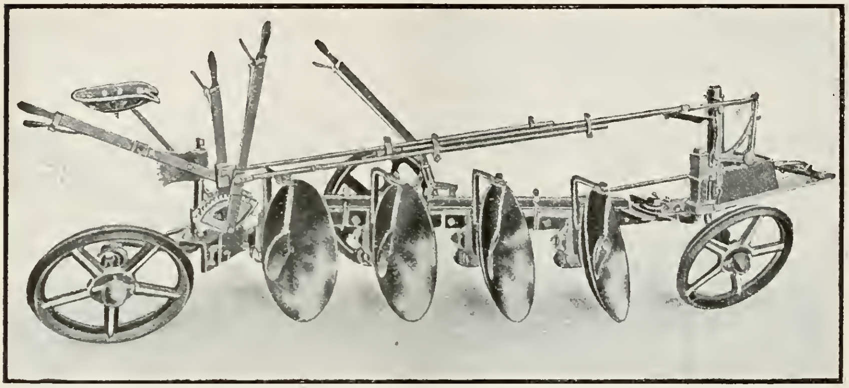

Fig. 4.—A Four-furrow Disc Plough. Suitable for shallow spring ploughing.

Discing before Ploughing.

The use of the disc harrow before ploughing is a practice that is not yet seen very much in this State, but it is one which can be confidently recommended. Where the land contains a heavy growth of weeds or cover crop, a ploughing has the effect of turning this organic matter under in a mass on top of the unploughed soil at the bottom of the furrow or between the furrow slices. If dry weather follows, the furrow slices dry out quickly and leave sour masses of decomposed organic matter at the bottom, which are repulsive to the delicate plant-roots. In such a dry period the young plants will be seen to wither and die because they are unable to make their way through this sour decomposed mass to the moist soil beneath. The use of the disc harrow before ploughing would chop up this vegetable matter and mix it well with the top soil, and subsequent ploughing would leave it well mixed and distributed through the whole of the worked soil. Where there is a heavy mass of green manure to turn under, the best method is to use the roller first and then give a good discing.

Weighting the disc harrow with a log, or something heavy, will enable it to do better work in a heavy crop. Where the soil is not covered with a green crop, the use of the disc harrow before ploughing loosens the surface, and not only prevents the escape of moisture but enables a deeper ploughing to be given. The pulverised soil which comes into contact with the bottom of the furrow slice makes quicker connection for the rise of soil moisture and prevents the formation of those large air spaces at the bottom of the furrows which take so long to fill where land is ploughed without discing.

For this reason discing before ploughing is a distinct advantage in spring, especially if the spring ploughing is the first one given, but its use before autumn ploughing will also set back, if it does not destroy, many weeds that had started to grow in the old crop between the last cultivation and harvesting. The discing in this case should take place as soon after harvest as possible, and ploughing can then be done more at leisure. A disc harrowing as soon as possible after harvest also destroys the pupæ of many insects in the soil which would escape injury from a ploughing alone.

Subsoiling.

Subsoiling is a practice that is not very often seen as a preliminary operation in maize growing, yet on heavy soils it might be expected to be an advantage, not so much on account of the increase of plant food material as of the increase in water-holding capacity during a dry season, and the insurance of better drainage in a wet season.

The results obtained from subsoiling, however, do not seem to justify the practice, seeing that the cost of the operation is fairly high, and a large increase in yield would be required to pay for it. Although subsoiling would not be done every year, it is estimated that it would require an increased yield of 10 to 15 bushels of maize per acre to justify its use.

Although no data are available of experiments of subsoiling for maize in this State, the following results of experiments in the United States of America show how disappointing subsoiling has been there :—

> On a grey silt loam, with a tight clay subsoil in Illinois,* an average of eight years gave a decrease of 2·7 bushels per acre from subsoiling.
>
> In Ohio† a five-year average showed an increase of 2·32 bushels per acre for subsoiled land, but it was not regarded as a profitable operation.
>
> In Alabama‡ a decrease of 1·9 bushels per acre resulted during the first year, and an increase of 0·7 bushels during the third year after subsoiling.
>
> On a clay soil in Mississippi§ subsoiling decreased the yield by 6 bushels per acre.

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* Illinois Agri. Exp. Sta. Bul. 181 (1915).
† Ohio Agri. Exp. Sta Bul. 282 (1915).
‡ Alabama Agri. Exp. Sta. Bul. 134 (1905)
§ Mississippi Agri. Exp. Sta. Bul. 170 (1915).

Harrowing.

After autumn or winter ploughing no further cultivation will usually be required until the beginning of spring. If the land has become compacted or weedy by this time it will require another ploughing, which need not be as deep as has been previously mentioned. If the soil has not become too set and if the weeds are not very formidable by the spring, the second ploughing may be dispensed with, and the land fitted with a disc harrow, or a spring-tooth cultivator.

The main object of cultivation until seeding time is to keep the surface loose to conserve moisture, to encourage weed seeds to germinate, to kill the weeds while small and tender, and to make a suitable bed for germination of the maize seed and the growth of the young plants.

The disc harrow is one of the best implements that can be used for fitting maize land for sowing, and one type of this harrow can now be obtained which can be converted into a cultivator by reversing the discs. This disc cultivator, which straddles the rows of maize, is by far the best implement to use in cleaning ground on which weeds have obtained a good start, and which no other cultivator will deal with effectively. The discs of the harrow may be set to any desired angle, to give a more pulverising and loosening action, but on loose open soil the discs have a more desirable effect in compacting the subsurface if they are set straight. Double discing may either take place across the field or in the same direction by half overlapping the first width. Both operations make a real good job. When the disc harrow is used to save a second ploughing in spring, a rather good set should be put on the discs in order to thoroughly loosen and crumble the soil.

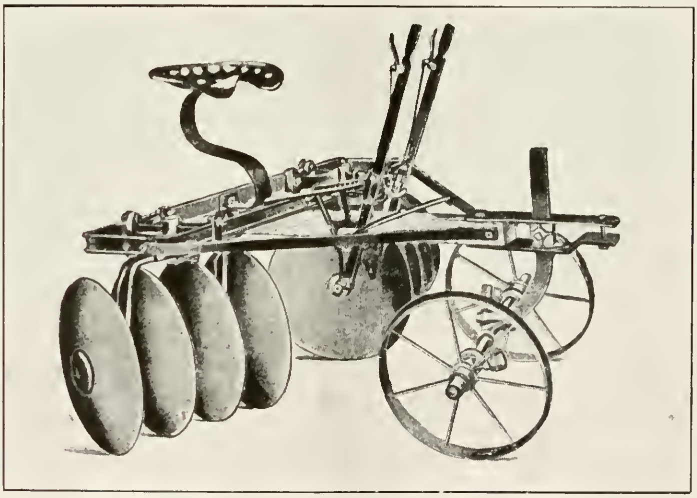

Fig. 5.—A Reversible Disc-harrow which can be changed into a cultivator by reversing the Discs

The spring-tooth cultivator is an implement that is also popular on large areas for maize. It leaves the surface in a loose fluffy condition, and deals with grass more effectively than the disc cultivator.

The rigid-tooth cultivator will deal with stronger tufts of grass more effectively than the spring-tooth cultivator, but does not leave the ground so loose and fluffy.

The tine or smoothing harrow is mostly required to give the final touch to the soil before planting. It covers the ground quickly and brings about a fine tilth and level surface which enables a planting to be made that is more uniform in depth.

Harrowing of some kind should always immediately follow spring ploughing to conserve moisture, and reference has been previously made to an excellent method for saving labour, viz., attaching a leaf of a tine harrow to the riding plough used in the spring ploughing.

There is a strange opinion among some farmers that maize does not require a well prepared seed bed owing to the larger size of the grain, but let it be noted here that although maize does not require "an onion bed," a cloddy, coarse seed bed means an unsatisfactory germination and less vigorous growth of seedlings. A good seed bed in which the seed can germinate readily and through which the young seedlings can easily make their way to the surface is even more essential for maize than for wheat, for maize seedlings are more tender in this respect than wheat seedlings.

Rolling.

The roller is becoming an old-fashioned implement which is seen less and less frequently on the farms of the best maize-growers. If maize land is prepared in the manner advised through these pages it will be found that the roller is seldom required. The conditions at sowing time that necessitate rolling—viz., when the land is not sufficiently firm, or where clods are present—can mostly be avoided by shallow spring ploughing, and the use of the disc harrow and the tine harrow at the right time.

It is on clay loam soil, which is cloddy and open at planting time, that the roller is mostly used, and it is on such soils that the use of the roller does most damage. When land of this nature is once rolled with a surface wet enough for the soil to stick to the roller, a large amount of the soil is put out of action by having its tilth spoilt for many years. In all cases where rolling is done it should be seen that the soil is sufficiently dry to avoid this.

Many farmers, too, leave their soil rolled firm and smooth, and when a heavy soil in this condition gets much rain it runs together very quickly and prevents the entrance of further rain, with the result that either water-logging or washing of the soil takes place. Both on account of this fact, and because rolling brings the moisture from the subsoil to the surface where it escapes by evaporation, a harrowing should follow rolling in every case.

The use of the roller on sandy loams does not do much harm to the physical character of the soil, but it can be dispensed with even here, and with better effect, by ploughing well in advance of seeding.

Top-dressing Lucerne with Superphosphate.

EXPERIMENTS AT GLEN INNES FARM.

FOLLOWING the highly satisfactory results from the application of superphosphate to lucerne at Glen Innes, as recorded in the issue for July, 1917, similar substantial increases have marked the use of the same fertiliser during the season just closed.

The Experiments Supervision Committee, under whose control the tests are being conducted, point out that while the results are for two seasons only, the profitable character of the method is so decisive that farmers may be strongly recommended to carry out similar experiments on their own lucerne beds. It is fully recognised that both the seasons have been characterised by heavy rainfall, thus enabling the full benefit of the fertiliser to be obtained.

The heavy black soil of basaltic origin is about 6 inches deep, and has a stiff retentive subsoil. This in a few feet passes into a yellowish decomposed basalt, which still further down merges into the basaltic rock itself. It cannot be classed as particularly suitable for lucerne, and the most profitable increases from the use of superphosphate may possibly be obtained on the less suitable types of soil, and thus materially enlarge the area laid down to the king of fodders.

The experiments will be continued at this Farm and extended to other Departmental farms.

The following summary has been compiled from the reports furnished by Mr. D. F. Rowney, Assistant Experimentalist at the farm, to Mr. R. H. Gennys, the Manager.

The Second Year's Results.

The area received the same treatment as before, being spring-tooth cultivated on 9th August, 1917, and the fertiliser applied with a 15-disc wheat-drill on the following day, the drill being run over the unmanured plots without the fertiliser running, to ensure that all the plots received the same treatment.

A total of four cuts was obtained. Throughout the season the manured plots were noted for their strong growth, healthy dark-green colour, and their comparative freedom from leaf spot.

The increase in the yield due to the fertilisers was very marked, even more so than in the previous season, as the summary of the results will show.

The percentage yield is based on the assumed or "natural" yield of the plot if treated in the same way as the check plots.

The plan of the experiment is as follows:—

Plot 1. (*Check.*) No manure.
2. 1 cwt. superphosphate per acre.
3. 2 cwt. " "
4. (*Check.*) No manure.
5. 1 cwt. superphosphate and ¼ cwt. sulphate of potash per acre.
6. 1 cwt. " ½ cwt. " " "
7. (*Check.*) No manure.

The plots were 1½ chain by 27 links, and thus comprised $\frac{1}{25}$ acre each.

GREEN FODDER WEIGHTS, 1917–18.

Plot.	1st cut. Yield per acre.				2nd cut. Yield per acre.				3rd cut. Yield per acre.				4th cut. Yield per acre.				Total Yield per acre.				Percentage Yield.
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	
1 (*Check*)	1	3	1	11	0	14	0	7	0	14	3	23	0	2	2	20	2	15	0	5	100·0
2	3	10	0	10	1	9	3	26	1	9	0	2	0	5	1	12	6	14	1	22	243·1
3	4	7	1	3	2	15	3	6	2	15	1	12	0	9	0	7	10	7	2	0	374·1
4 (*Check*)	1	4	1	9	0	13	3	16	0	14	2	26	0	2	2	20	2	15	2	15	100·0
5	4	2	2	10	2	11	1	10	2	9	1	9	0	8	0	4	9	11	1	5	350·5
6	4	6	2	12	2	14	2	18	2	17	0	26	0	7	3	7	10	6	1	7	385·5
7 (*Check*)	1	3	3	15	0	12	0	6	0	13	3	10	0	2	2	20	2	12	1	23	100·0
Date of cutting and weighing.	2nd Oct., 1917.				5th Dec., 1917.				28th Jan., 1918.				9th April, 1918.				244 days for growing period.				
Rainfall, points ..	766				998				785				469				3,018 for growing period.				

A More Extensive Experiment.

The 1916–17 results were so satisfactory that the committee decided on a larger experiment in duplicate and omitting the sulphate of potash, which is commercially unobtainable. The area was cultivated crossways with the spring-tooth cultivator on 9th August, 1917, and when applying the fertiliser on the following day with the wheat drill, the tubes were taken out and left hanging to allow of the even distribution of the fertiliser throughout the plots. All the plots received a light harrowing on the 11th August.

The arrangement of the plots was as follows:—

Plots 1, 4, 7 (*checks*). No manure.
2 and 5. 1 cwt. superphosphate per acre.
3 and 6. 2 cwt. „ „

The plots were 2·06 chains long and 0·81 chains wide, and thus were approximately $\frac{1}{6}$ acre each.

Three cuts were obtained from this area, and the results may be summarised thus:—

GREEN FODDER WEIGHTS, 1917–18.

Plot No.	1st cut. Yield per acre.				2nd cut. Yield per acre.				3rd cut Yield per acre.				Total Yield per acre.				Percentage Yield.
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	qr.	lb.	
1 (*Check*)	0	15	1	14	0	18	1	20	0	1	1	22	1	15	1	0	100·0
2	1	13	3	0	1	5	1	22	0	2	1	8	3	1	2	2	187·2
3	2	7	2	14	2	11	2	22	0	2	3	22	5	2	1	2	334·9
4 (*Check*)	0	11	2	26	0	15	1	14	0	1	0	8	1	8	0	20	100·0
5	1	11	2	22	1	4	0	14	0	1	0	20	2	17	0	0	192·1
6	2	2	3	20	2	1	1	6	0	2	1	6	4	6	2	4	277·8
7 (*Check*)	0	14	0	4	0	17	0	22	0	1	1	16	1	12	2	24	100·0
Date of cutting	1st Dec., 1917.				4th Feb., 1918.				9th April, 1918.				244 days for growing period.				
Rainfall, points	1,675				1,102				241				3,018 for growing period.				

On comparing the result of the two experiments the advantage of the yearly application of the superphosphate on such a soil can be noted, the smaller plots having received fertiliser two years in succession, but giving greatly enhanced yields.

Financial Results.

Sulphate of potash, even at its pre-war price, is too costly a top-dressing when compared with superphosphate, and the increase in yield due to its application is not sufficient to justify the extra cost per acre, except perhaps on soils deficient in potash. The basaltic soil of Glen Innes Farm has not been depleted of this constituent.

At the present time, when sulphate of potash is practically unobtainable, it is difficult to arrive at its cost per acre, and it has consequently been omitted from the following calculations:—

Green Fodder Weights.	Second Year.		First Year.	
	1 cwt. superphosphate per acre.	2 cwt. superphosphate per acre.	Average of Plots 2 and 5, 1 cwt. per acre.	Average of Plots 3 and 6, 2 cwt. per acre.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Total yield ..	6 14 1 22	10 7 2 0	2 19 1 1	4 14 1 17
Natural yield ..	2 15 1 5	2 15 1 24	1 11 1 3	1 10 3 10
Difference due to fertiliser	3 19 0 17	7 12 0 4	1 7 3 26	3 3 2 7
	£ s. d.	£ s. d.	£ s. d	£ s. d.
Value of difference on basis of 15s. per ton.	2 19 4	5 14 0	1 1 0	2 7 8
Cost of fertiliser at 5s. per cwt. ..	0 5 0	0 10 0	0 5 0	0 10 0
Profit from use of fertiliser	2 14 4	5 4 0	0 16 0	1 17 8

It is obvious that on such soils as those at Glen Innes Experiment Farm, and in a season of abundant rainfall, the higher rate of application is much the more profitable, and this should induce lucerne growers to carry out similar tests with a view to ascertaining the effect of the application of superphosphate under their own climatic and soil conditions.

VERVAIN (*Verbena officinalis*).

WE have had a remarkable growing season in many parts of the State from spring to autumn 1917–18, and it is a pity that the history of the weed spread during that period in New South Wales cannot be written. I content myself with a brief note in regard to one of them, which is a native plant, although also occurring in Europe and other parts of the world.

This common Vervain is a wiry unornamental plant, with small purplish flowers, and this season it has made its appearance in enormous quantities on the western plains, the western slopes, the Riverina, and to a less extent on the tablelands and coastal districts.

So far as I know it is a worthless plant, possessing no fodder value, and no poisonous properties. It seems, like many other weeds, to have its cycles of spread, which are connected doubtless with natural meteorological conditions. It was so abundant on the Dawson River, Queensland, that Leichhardt, in his Overland Expedition to Port Essington in 1844 (see his Journal, pages 35 and 36), gave the name "Vervain Plains" to large areas because of the prevalence of this weed.—J. H. MAIDEN.

The Peanut.

[Continued from page 433.]

W. D. KERLE, Assistant Inspector of Agriculture, and Experimentalist,
Hawkesbury Agricultural College.

Uses.

Few crops, if any, have such a wide range of usefulness as the peanut. The entire plant can be profitably made use of: the vine as stock food, the nut as food for man and beast, the husks as adulterants in food preparations, and the roots for augmenting the soil's supply of nitrogen.

The majority of people are apt to regard the roasted nut as the sole product derived from the plant, but this is only one of a great number of uses which have developed in recent years.

For a satisfactory discussion, it becomes necessary to study its uses under two main headings, (1) its uses on the farm, and (2) its prepared products.

Uses of the Peanut on the Farm.

The peanut is of primary importance to the farmer as a soil-renovating and soil-enriching crop. This is due to the power it possesses of assimilating atmospheric nitrogen and storing it in nodules on its rootlets, through the agency of certain microscopic organisms (rhizobia). For this purpose it is of almost equal value, and will thrive under harsher soil and climatic conditions than the cowpea. The vines, when properly cured, make a nutritious palatable hay, useful for all classes of stock, but being rich in nitrogenous matter they are better fed combined with concentrates rich in carbohydrates, as maize. The digestible coefficients of peanut vine hay are: protein, 63; fat, 66; carbohydrates (nitrogen-free extract) 70; fibre, 52.

The tops in their green state make excellent forage for pigs and cattle, but must be fed, at the outset, in limited quantities. A profitable method of cultivation is to plant peanut seed between the rows of maize, just prior to the tasselling stage. After the maize is harvested, cattle are turned in to eat the maize stalks and the peanut tops, and later pigs to unearth the nuts that will have formed.

From 1 to 3 tons of hay may be obtained. The tops may be mown, cocked, and thoroughly dried before storing, the nuts being then harvested for market or stored for feeding purposes. The entire plant may be cured and fed to cattle, either whole or in a chaffed condition. As such it practically forms a balanced ration for a milch cow; and has proved superior to a ration composed of ordinary hay and maize as a feed for horses.

The value of peanuts for feeding to pigs has been clearly demonstrated by repeated experiments in the United States of America. At the Alabama Experiment Station,* Gray, Duggar, and Ridgeway found that 1 acre of good peanuts was equal to about 3,200 lb. of maize in feeding value, and that pigs getting 1·6 lb. of maize daily and foraged in a peanut field gained 0·9 lb., as against 0·7 lb. gained when fed on 3·8 lb. maize only. Duggar also found* that hogs turned into a peanut field gained 100 lb. from 190 lb. of maize and 140 lb. of peanuts together with the vines. He also reports various trials in which peanuts returned from 225 lb to 432 lb. of pork per acre when fed with skim-milk, maize, &c. The same station also made the following comparison of foodstuffs required, with pasturage, to produce 1 lb. of pork :—

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* Farmers' Bulletin, 431, U.S. Dep. of Agric.

Peanuts, 1·77 lb. Sweet Potatoes, 3·13 lb.
Cowpeas, 3·07 lb. Sorghum, 3·70 lb.

At the Arkansas Experiment Station† Bennett found that :—

1 acre of peanuts gave a gain of 1,252 lb.
1 ,, maize ,, 436 lb.

At Georgia Experiment Station‡ Flint reported that :—

274 lb. maize and shorts produced 56 lb. of gain.
254 ,, 449 lb. skim-milk produced 76 lb. of gain.
160 ,, $\frac{1}{6}$th acre Spanish peanuts produced 71 lb. of gain.

The peanuts were pulled daily and fed to the pigs ; equally as good results would have been obtained from foraging the crop.

The foregoing results of carefully-conducted experiments are convincing evidences of the suitability of the peanut for pork production. The pork of pigs fattened solely on peanuts is, however, soft and oily, and the lard is of so low a melting point as to be solid only in the coldest weather. This can be remedied by feeding in moderation, and finishing off on maize. That it is not a serious defect is proved by the fact that the famous Smithfield hams and bacons come from pigs fed partially on peanuts. The most economical method of feeding to pigs is to cut the tops for hay, and hurdle off the field in sections, turning in the hogs for a limited time each day to harvest the nuts. This will decrease wastage and ensure a minimum of injury to the physical condition of the soil. Peanut cake or meal is a valuable concentrated food for pigs, especially when fed in combination with foods containing less oil and nitrogenous constituents.

Taking into consideration the ease with which the crop can be grown, the readiness with which pigs harvest and fatten on it, the excellent forage derived from the vines, and the improvement to the soil, the possibilities of the peanut for pig-raising are apparent.

Pigs, cattle, horses, and sheep relish and thrive on peanuts, and the crop has proved of considerable value for fattening poultry for market.

The Prepared Products.

Practically the only trade done in Australia is in roasted peanuts, but in other countries the nuts have a wide range of utility. Only those of the highest grade produced by the cleaning and grading factories are used for roasting purposes. Roasting plants have already been established in New South Wales, where the nuts imported by Chinese merchants from Oriental countries are treated. The roasting process is a simple one, dependent mainly on a uniform, even heating of the pods. For roasting small quantities, Dr. Smith, an American farmer on the Murrumbidgee Irrigation Area,* suggests the use of a carbide drum with handles attached to the ends; it should be filled with peanuts to two-thirds of its capacity, and made to revolve slowly over a trench fire. Roasting will occupy fifteen to thirty minutes, and is complete when the nuts have turned slightly brown in colour. A drum of this kind will roast 30 to 35 lb. of peanuts at one time.

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* Farmers' Bulletin, 93, 122, U.S. Dep. of Agric.
† ,, ,, 54, ,, ,,
‡ ,, ,, 87, ,, ,,

There is a good market in New South Wales for first-grade roasting peanuts, which, if marketed in a satisfactory manner, would be purchased by merchants in preference to importing from the East. Samples of the nuts grown at various experiment farms in the State were submitted to several of the leading Chinese merchants and importers of Sydney, who stated their willingness to give 3d. per lb. for the Valencia and 2¼d. per lb. for Spanish, which, taking into consideration the heavier weight of the latter variety, is equivalent to practically the same price per bushel. Even at these prices, which were given some years ago and which are decidedly low, there is a good margin of profit for the grower.

There is an extensive trade done in the United States in salted and blanched nuts. Salted nuts are prepared by shelling, roasting, and salting high grade nuts. Blanched nuts are employed largely for table use, and in the manufacture of peanut butter and high grade confectionery. They are prepared by first roasting in the shell, with the object of retaining the nutty flavour. After cooling the nuts are shelled, and then fanned to remove the shells and husks; they then go to the blanching machines, which remove all the skins from the kernels and drop them on to screens, where the broken nuts are separated. They are then hand-picked, all the small and unblanched nuts being removed, leaving the finished product with which we are familiar.

The confectionery trade absorbs large quantities of nuts in the manufacture of candies, brittle "burnt almonds," nut chocolate, &c., or in conjunction with other nuts, popcorn, puffed rice, &c. They are also used largely in the preparation of vegetarian "meats."

A product of the peanut which is in increasing demand is "peanut butter." It is manufactured by preparing the nuts as when blanching, and reducing to a pulp by special grinding machinery. Salting can be done in the process, but it is frequently left to the consumer to salt to his requirements. It is sold in tightly-sealed bottles or tins, and forms a very pleasant article of diet. There are in the United States numerous factories equipped with special machinery capable of turning out many tons of peanut butter per day. The Spanish variety is greatly in demand for making this much-relished preparation.

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* Irrigation Record, 1914.

Peanut oil is one of the leading food products of the world. France uses 16,000,000 gallons of edible oil, and soap manufacturers utilise 23,000,000 gallons of low grade oil, per annum. Germany, under pre-war conditions, used 6,000,000 gallons of high grade oil. The United States of America imports, above her own manufactures, 1,500,000 gallons, the major portion of which is used in the manufacture of oleomargarine. Oil mills have been established in all the principal peanut-growing districts of the States. The machinery used in cotton oil mills can, with but slight modifications and adjustments, also be used for expressing peanut oil. The oil of highest grade is produced by thoroughly cleaning, shelling and de-germing the nuts before pressing. The first cold pressure yields up to 20 per cent. of fine oil ; a second cold pressure may next be given, or the nuts may be slightly warmed and then pressed, giving from 7 to 10 per cent. of a less valuable oil. The residue, tempered by heat, may be subjected to three or four pressings before all the oil is finally extracted. (Fig. 16.) The oil resulting from the first cold pressure is almost equal to high grade olive oil. It is sweet, palatable and clear, and may be used for every purpose to which olive oil is applied ; in fact, large quantities of peanut oil are substituted, unknown to the consumers, for olive oil.

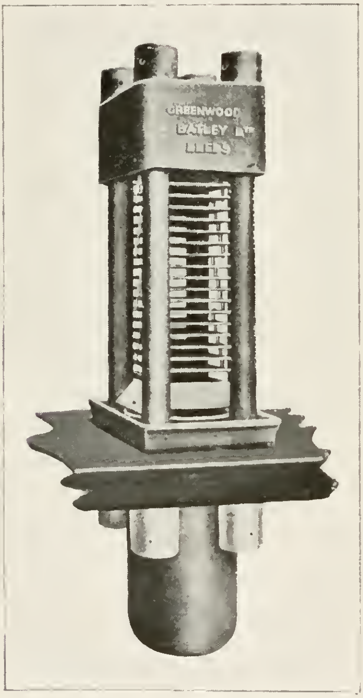

Fig. 16.—One form of Hydraulic Oil Press.

The oil obtained from the second and third pressings requires to be refined before it is suitable for culinary purposes, or for the manufacture of oleomargarine. As the unrefined product it is largely utilised for soap-making. The screenings from peanut butter manufacture, together with the by-products of the shelling factories, are utilised in the production of low grade oil.

Frequently the lower grade nuts are pressed without shelling, yielding a satisfactory oil for soap-making and a meal suitable for stock feed, containing 28 per cent. protein, 8 per cent. fat, and 40 per cent. carbohydrates.

One ton of nuts so pressed will yield 1,350 lb. of meal. Besides its extensive use for culinary purposes and for the manufacture of oleomargarine and soap, peanut oil is largely used in European countries as a lubricant and lighting fluid.

One ton of peanuts will yield 80 gallons of oil and 750 lb. of meal, although some factories will only press 60 to 65 gallons per ton, their equipment being insufficient to get the higher results.

A very valuable by-product of peanut oil manufacture is peanut meal or cake, which is the residue that remains after the oil has been expressed. By analysis this has been shown to be one of the richest of known foods, particularly as regards the amount of crude protein it contains (see Table II, p. 432 of the June issue). Results of numerous experiments conducted in various parts of the world have proved it to be an excellent foodstuff for all classes of stock, particularly when fed in combination with other feeds rich in carbohydrates. Low-grade peanut meals are made from the waste products of peanut factories. These may consist of broken and undersized nuts, germs, hulls, and husk coverings which when ground form a very palatable meal.

The high nitrogen-content of the germs has a tendency to send by-products rancid, which is the only objection to their use. This, however, can be obviated by not keeping a stock on hand for longer than two months.

Peanut hulls are comparatively rich in food constituents, and are sometimes ground and used as roughage, or for adulterating stock food preparations. They are suitable for bedding down stock, and being rich in fertilising constituents benefit the soil if distributed on the land with the manure.

Departmental Trials with Peanuts.

In June, 1912, the Department of Agriculture, Washington, U.S.A., in compliance with a request from the New South Wales Department, forwarded 5 lb. each of the seed of the three varieties, Spanish, Valencia, and Virginia Bunch. These were forwarded to Hawkesbury Agricultural College and Grafton Experiment Farm for trial. Trials have been conducted annually at these institutions since 1912, and at Yanco Experiment Farm since 1914.

(*a*) *Hawkesbury Agricultural College.*—Previous to the trials with the imported varieties above mentioned, experiments were carried out with four others, *i.e.*, Gambia, Rufisque, Common, and Mombassa, obtained in 1906 from Bombay, India. They proved unsuitable for our conditions, and trials were discontinued after a period of three years.

The experiments with the American nuts have been conducted since 1912 on a light, greyish, sandy loam, uniform in character. It is almost an ideal soil for peanut culture, but the climate is too uncertain—the summer often too moist, the temperatures too variable, and the autumn usually too wet for successful harvesting.

The first trial was sown on 6th October, 1912, and included a variety which had been grown in the State for a number of years, which was called Local. The seed germinated excellently, and made good growth in November, but suffered rather from hot dry winds in December and January. Heavy rains in May and June (1913) caused a large percentage of all varieties to rot in the ground before they could be harvested, and the yields unfortunately were not obtained. They showed themselves, however, to be worthy of further trial.

In 1913 and 1914 the experiments were continued, but no yields were recorded.

In 1915 the trial was sown on 20th September. That year proved to be the driest ever recorded in the district, only 16·725 inches of rain being recorded in the year, and 11·40 inches during the course of the experiment. Further trials were made in 1916, the plots being sown on 16th November. The season was exceptionally wet in the spring and summer, and dry in the autumn. During the growth of the crop 16·840 inches of rain were recorded.

The yields of these two years, the only ones obtained since the commencement of the trials in 1912, were as follows :—

Variety.	1915.				1916.								Average Yield of Peanuts.
	Yield per acre.				Yield per acre.				Weight of Hay.				
	c.	q.	lb.	bus.	c.	q.	lb.	bus.	t.	c.	q.	lb.	bus.
Valencia	5	0	0	28·00	13	2	0	68·75	1	1	1	3	48·38
Spanish	4	3	0	17·73	12	3	12	48·00	1	0	3	21	32·87
Local	5	1	0	29·40	9	3	18	50·11	1	5	1	0	39·76

The results at this Farm favour the Valencia variety. Although Local appears to be prolific, it invariably produces a big percentage of unfilled pods. The experiments indicate that the crop is a risky one in this locality, owing to the uncertain nature of the climate.

(*b*) *Grafton Experiment Farm.*—The first sowing of the varieties Valencia, Spanish, and Virginia Bunch was made on 13th September, 1912, on a red basaltic clay loam, apparently uniform in character. The season that year was a comparatively moist one, 22·34 inches of rain being recorded during the growth of the crop. The relatively low yields obtained were due to weed growth, and consequent checking of the plants, rather than to seasonal conditions.

On 9th October, 1913, plots were again sown, and this season, contrary to the last, was a dry one, only 10·92 inches of rain being recorded, and the plants received many checks. The growth under such adverse conditions was however, extraordinary and the yields phenomenal.

In August, 1914, samples of the varieties were tested to determine their value for roasting, and Virginia Bunch was found to be inferior in flavour and quite unsatisfactory. It was decided that further trials with it were unwarranted. The Valencia variety, however, was regarded as approaching nearest to the requirements of the trade, and more extended trials were considered advisable. Accordingly, an increased acreage was sown on 3rd November, 1914. The rainfall during growth was 14·18 inches. It was very dry at the time of flowering and of setting the pods, and this militated against high yields being obtained. However, the plant proved its drought-resisting qualities. The yield of 95½ bushels per acre of marketable nuts was very satisfactory, considering that 34 bushels is the average yield in the United States, and 60 bushels is considered very good.

The high content of iron in the soil on which these experiments were conducted has the effect of staining the shells a dirty brown colour, which considerably depreciates their market value for roasting. It was deemed advisable to sow elsewhere, and on 28th September, 1915, they were sown on the "poor land" of the farm. This is a sandy loam, greyish in colour, with a well-drained clay subsoil. Thick ti-tree scrub was cleared from this soil, and the ground first ploughed in February, 1915. Of each of the three varieties, Spanish, Valencia, and Local, ⅛ acre was sown. The season was one of extremes, drought conditions obtaining in the first three months of growth and heavy monsoonal rains at frequent intervals for the remainder. The rainfall during the period of the trial was 24·85 inches, of which only 1·81 inches fell in the first three months. The imported varieties withstood the severe test, but Local suffered severely.

The following table summarises the results of the experiments at this farm:—

Season.	Valencia.	Spanish.	Local.	Virginia Bunch.
Weight per bushel ..	22 lb.	30 lb.	22 lb.	22 lb.
	bus.	bus.	bus.	bus.
1912	19·84	18·50	......	32·32
1913	65·44	66·33	......	124·55
1914	95·50	......	......	......
1915	112·50	121 00	36·75	......

In 1915 the following yields of hay per acre were obtained:—

	t.	c.	q.	lb.
Valencia	2	3	2	8
Spanish	1	5	0	16
Local	0	12	2	24

It is worthy of note how rapidly the yields have increased, due rather to acclimatisation of varieties than to seasonal influences.

The results are convincing evidence of the suitability of the North Coast for the crop. There are large areas of land in that district capable of producing high yields of marketable nuts. The climate, too, is all that could be desired—an early spring, a warm moist summer usually free from severe drought, and an autumn with little precipitation to injure the vine and nuts at harvest time. If the peanut industry develops in New South Wales as it should, then the North Coast will be found to contribute largely to the annual output, for in no other portion of the State do soil and climate so nearly approximate the ideal. The cost of production is estimated to be less than the value of the forage produced, exclusive of the nuts obtained, and the crop may therefore be recommended to North Coast farmers for trial on small areas or on land deficient in humus or nitrogen.

(*c*) *Yanco Experiment Farm* (*under Irrigation*).—Trials with the American peanuts in comparison with Local were first conducted in 1914. The season was a very dry one, and from 15th October to May, 1915, seven irrigations were given. The soil on which the trials have been conducted is a stiff reddish clay loam, typical in colour of the majority of the Murrumbidgee Irrigation Area. Such soils are probably unsuitable for the production of marketable nuts for roasting, owing to the staining of the pods and the present prejudice against any but a bright-coloured nut.

On 22nd September, 1915, the trials were continued. The season was, for the most part, hot and dry, and irrigations were given about once in twelve days during the hottest months, and with intervals of twenty-one days during the cooler period. The yields obtained for the two years were :—

Variety.	1914.	1915.					Average Yield of Peanuts.	Bushel weights.
	Yield per acre.	Yield per acre.	Yield of Hay per acre.					
	bus.	bus.	t.	c.	q.	lb.	bus.	lb.
Valencia ...	41·00	107·73	2	5	0	11	74·37	22
Spanish ...	84·00	27·00	1	3	3	2	55·55	30
Local ...	60·00	117·81	2	1	0	16	88·91	22

The yields at this farm have not been very consistent, but at the same time some extraordinarily high ones have been obtained ; these indicate the suitability of the crop to soil, climate, and irrigation. Similar results have been obtained by several farmers within the Area. If the market were assured, peanut-growing would become an important industry in this portion of the State, particularly the production of nuts for the manufacture of by-products, such as peanut oil, peanut butter, &c., for which the staining of the shells is no detriment. For the present it can be recommended to farmers for improving and renovating their soils, and as a feed for pigs, especially if the foliage is cut and cured and the pigs turned in to forage for the nuts. Hogs will fatten quicker on peanuts than any other class of food, but they must be finished off with a grain rich in carbohydrates, such as maize, for, as already explained, peanuts have a tendency to produce a soft and oily pork.

Prospects.

The trials conducted by the Department of Agriculture have demonstrated that high yields of peanuts, suitable for any branch of the trade, can be produced in this State. In other States of the Commonwealth there are thousands of acres of suitable land, with climatic conditions eminently fitted for the production of peanuts. There is no reason, as far as these factors are concerned, why the industry should not become just as important here as in the United States of America. While admitting that the Australian labour costs are much higher than those of the United States of America, the industry may be placed upon a profitable basis by the importation of labour-saving machinery.

At present the market for peanuts is limited, but 150,000 bushels are imported per annum from China and Japan, and are worth approximately £30,000. The market is controlled by Chinese merchants, who naturally prefer nuts imported from the East, but who have expressed their willingness to use locally grown nuts if equal in quality.

The duty on peanuts is 2d. per lb., and the cost to Chinese merchants before the war was 4¼d. per lb. duty paid, and their retail price after roasting 4¾d. per lb. The import duty would need to be increased to give encouragement to local growers, who should realise 5d. or 6d. per lb. f.o.r. Sydney. At these prices the gross return per acre from suitable ground in a normal season would be from £50 to £60.

The nuts imported for roasting are uniform in shape and very clean, and local farmers can only hope to compete with Oriental growers by copying their example and submitting only well graded nuts of a bright clean appearance and free from soil.

The market at present is particularly good owing to the uncertain freight, but post-war conditions should not be any the less favourable to the growth of the industry.

The quantity of peanut oil imported into Australia per annum is very considerable, and there is a big industry to be worked up in this branch of the trade. There is a duty of 2s. 6d. per gallon on all vegetable oils imported for edible purposes. Large importations of crude vegetable oils for soap-making are also made each year, which are denatured in bond, and when so treated come in at 6d. per gallon. There are no mills in Australia for expressing peanut oil, but there are several large firms crushing linseed, copra, castor beans, &c., who, with but slight modifications to their machinery, could crush peanuts if sufficient inducement offered.

Farmers do not realise sufficiently the value of the peanut as a fattening crop for pigs and a fodder crop for all live stock, or that it will produce profitable crops on soils of a light sandy nature too poor to grow other summer crops successfully.

The factors which would seem to indicate that the peanut industry could be placed on a profitable basis in this State may be summarised as follows :—

1. There are large areas of suitable land.
2. The climatic conditions are favourable.
3. There is an extensive market for nuts of good quality for roasting and confectionery.
4. There are large quantities of edible and crude peanut oil imported annually which could be produced locally.
5. The leading importers are prepared to use locally grown nuts if the quality is equal to the imported article.
6. The protection afforded by the import duties of 2d. per lb. on nuts and 2s. 6d. per gallon on edible oil, with the possibility of increased duty when the area of production warrants it.
7. Excellent machines for handling in all stages of the industry are procurable from overseas.
8. The uses to which the peanut is put are ever increasing, and the demand greater each year.
9. It is of considerable value on the farm holding as a soil-renovating crop and a quick-fattening fodder for all classes of stock.

Sheep and Wool for Farmers.

CROSS-BREEDING EXPERIMENTS.

THE WOOL AND MUTTON TYPE.

[Continued from Volume XXVII, page 407.]

J. WRENFORD MATHEWS.

BATHURST EXPERIMENT FARM RESULTS.

A SUMMARY of the results of the trials which have been conducted at this Farm may now be undertaken. Bathurst constitutes the third farm at which these investigations are being conducted. Reports have previously been published giving particulars of four years at Wagga* and five years' results at Cowra.† Published two years later, the present summary embraces altogether seven years' work. This comprises four years' records at the lamb stage and for the mating periods of 1911, 1912, 1913, and 1914, together with a similar record of the development of the sheep at more advanced stages, viz., 1 year 4 months, 2 years 4 months, 3 years 4 months, and 4 years 4 months, and for the periods 1912–1915, 1913–1916, 1914–1917 for both ewes and wethers.

Seven years' records are shown for the lambs born in 1911, six years records for those dropped in 1912, and similarly five years for those born in 1913 and four years for 1914 in progressive order of increase and yearly development.

For the purpose of explanation and comparison, it might be repeated for the benefit of later readers that the Longwool rams under review were in the first instance mated with the Merino ewes for four successive years. The sheep were joined during December and January each year, so that the lambs dropped in 1911 were three years old when the weights of those born in 1914 were recorded. The development of the sheep at the older ages has also been recorded.

Scope of the Investigations

The stipulated period over which the tests were to be conducted was five years and four months. A check was kept on both the wether and ewe progeny. Upon attaining that age the wethers were each year disposed of, or otherwise eliminated from the trials. The ewes, however, were retained for breeding purposes, and as at the younger ages, a record was kept of their development until the lambs dropped in 1914 reached the stipulated age.

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* Vol. XXV, February, June, July, and August, 1914.

† Vol. XXVII, May and June, 1916.

The trials could not be carried out at Bathurst on as extensive a scale as at Wagga and Cowra, owing to the limited area. The same methods were adopted as at the other two experiment centres, making due allowance for the difference in district and climate, as well as slight modifications in feeding.

Methods of Feeding and Management.

The Farm comprises an area of 600 acres, but includes no natural pasture, so that the feed has to be produced on the Farm. The arable land available for sheep consists of about 500 acres, and over a period of seven years the number carried averaged 348.

The ewes were mated as soon as the main cereal crops were harvested, and were run on the stubbles, usually available early in January. Rape and barley, or rape and oats, were sown during February, to provide winter feed. This, when seasons were favourable, was fit to graze in April, and by alternately feeding off the paddocks an abundance of fodder was available from April to October. The general practice has been to dispose of the second-cross lambs in the spring. This allowed of the fodder crop residues being ploughed in and the land fallowed for the succeeding year's wheat crop. During the interval the sheep were kept on the stubbles, while during the summer, lucerne occasionally afforded a green picking. The winter fodder crops carried from five to six sheep per acre in normal seasons.

During cold winter nights the pasture feed is supplemented by cavings and beeswing chaff from the threshing machines, mixed with molasses.

The appended tables give the plan of mating and the scope of the investigations at this Farm.

CROSS-BREEDING EXPERIMENTS WITH SHEEP AT BATHURST EXPERIMENT FARM.

TABLE I—For Wool.—Rate of increase from 150 Merino Ewes when mated with Longwools (British Breeds) for a period of four years, and indicating how the progeny may be disposed of each year during that period.

Breed of Rams.	No.	1911.				1912.					
		Merino Ewes.	Cross-breds.			Merino Ewes.	Cross-breds.				
			Increase estimated at 70 per cent.				Increase estimated at 70 per cent.				
			Ewes.	Wethers.			Ewes.		Wethers.		
			To Keep.	To Sell.	To Keep.		Keep.		Sell.	Keep.	
							Increase.	Total.	Increase.	Increase.	Total
Lincoln	1	50	18	11	6	50	18	36	11	6	12
Leicester	1	50	18	11	6	50	18	36	11	6	12
Border Leicester ..	1	50	18	11	6	50	18	36	11	6	12
Totals ..	3	150	54	33	18	150	54	108	33	18	36

TABLE I—For Wool—*continued.*

Breed of Rams.	No.	1913.						1914.					
		Merino Ewes.	Cross-breds.					Merino Ewes.	Cross-breds.				
			Increase estimated at 70 per cent.						Increase estimated at 70 per cent.				
			Ewes.		Wethers.				Ewes.		Wethers.		
			Keep		Sell	Keep.			Keep.		Sell.	Keep.	
			Increase.	Total	Increase.	Increase.	Total.		Increase.	Total.	Increase.	Increase.	Total.
Lincoln	1	50	18	54	11	6	18	50	18	72	11	6	24
Leicester	1	50	18	54	11	6	18	50	18	72	11	6	24
Border Leicester..	1	50	18	51	11	6	18	50	18	72	11	6	24
Totals ..	3	150	54	162	33	18	54	150	54	216	33	18	72

TABLE II—For Early Lambs.—How the above 216 (estimated) cross-bred ewes may be utilised in the raising of early lambs, which should be marketed at from four to five months, for a period of four years.

Breed of Rams.	No. of Rams.	1912.				No. of Rams.	1913.			
		Cross.					Cross.			
		Lincoln-Merino.	Leicester-Merino.	Border Leicester-Merino.	Total.		Lincoln-Merino.	Leicester-Merino	Border Leicester-Merino.	Total.
		No available, 18.	No. available, 18.	No. available, 18.	54		No. available, 36.	No. available, 36.	No. available, 36.	108.
Southdown ..	1	6	6	6	18	1	12	12	12	36
Shropshire ..	1	6	6	6	18	1	12	12	12	36
Dorset Horn ..	1	6	6	6	18	1	12	12	12	36
Totals ..	3	18	18	18	54	3	36	36	36	108

Breed of Rams	No. of Rams	1914.				No. of Rams.	1915.			
		Cross.					Cross.			
		Lincoln-Merino.	Leicester-Merino.	Border Leicester-Merino.	Total		Lincoln-Merino.	Leicester-Merino.	Border Leicester-Merino.	Total.
		No. available, 54.	No. available, 54.	No. available, 54.	162.		No. available, 72	No. available, 72.	No. available, 72.	216.
Southdown ..	1	18	18	18	54	2	24	24	24	72
Shropshire ..	1	18	18	18	54	2	24	24	24	72
Dorset Horn ..	1	18	18	18	54	2	24	24	24	72
Totals ..	3	54	54	54	162	6	72	72	72	216

The Merino Ewes.

Ewes uniform in class and carrying a moderately coarse type of wool were employed, as in former instances. It was found necessary, however, to replenish the flock during the first two years, owing to the original lot being too old to continue to breed from them. To meet the carrying capacity of the Farm it was also found necessary to reduce the number as set out in the original plan. The following table shows the number of ewes employed each year :—

Year.	1911.	1912.	1913.	1914.
Breed of Ram.	No. of ewes to ram	No. of ewes to ram.	No. of ewes to ram.	No. of ewes to ram.
Lincoln	42	47	50	46
Leicester	41	49	50	47
Border Leicester ..	41	48	50	47

Typical Lambs of the Leicester-Merino Cross.

The Young or Old Ewe.

The draft that replaced those used in 1911 mainly comprised maiden ewes. They were of the well-known South Australian type, plain in body, with a wool no finer than the 60s quality. The balance of the old ewes were weeded out before the 1913 mating, when younger ewes again replaced the remaining older ones.

With the ewes thus mixed in age the opportunity was afforded, in 1912, of observing the merits of the younger against the older ewes as to disability in effecting delivery of lambs to larger-bodied British breeds. With this object the ewes at their various ages were equally divided among the rams, with the following result :—

Age of Ewe.	No.	No. of Lambs.	Percentage of Lambs.
Maiden (rising 2 years) ..	96	61	63
3 years	29	22	75
5 and 6 years	19	13	68

Though 1912 was a bad year, it nevertheless afforded a favourable opportunity of collecting evidence as to difficulty at parturition.

Commenting on the results, the late manager states that "whilst considerable difficulty was experienced in getting the young ewes to mother their lambs, no trouble through desertion was met with in the case of the older ewes, despite the severity of the conditions prevailing. Altogether, thirteen ewes were assisted ; four were maidens, five were 3-year-olds, and three were 5-year-olds—all of which had been served by the Border Leicester ram. The remaining one was a 5-year-old, and had been served by the Lincoln."

The results point to the older ewe being the best mother, and this apparently more than compensates for any advantages the younger may have over the older ewes in respect of disability at parturition.

The Rate of Increase.

The main object of the trials was to put the breeds upon a competitive basis in order to test their more essential qualities, namely, the production of wool and mutton combined. At the same time, note was taken whether the disposition to breed was revealed in any one breed more than another. As at Wagga and Cowra, figures relative to the trouble experienced by the ewes in effecting delivery of the lambs have been collected. They include the number of ewes assisted and those dying at the time of lambing, as well as the number of lambs that died before and after marking.

TABLE showing, for comparative purposes, the Percentage of Merino ewes assisted and those that died at parturition, as the result of mating with rams of different Longwool breeds.

Breed of Ram.	No. of Ewes mated.	No. of Ewes assisted.	Death of Ewes. Parturition.			Death of Lambs. Marking.		Percentage of Ewes.	
			Before.	At.	After.	Before.	After.	Assisted.	Lost.
Year 1912.									
L_1	47	1	...	...	...	...	...	2·12	...
L_2	49	...	...	...	...	...	...	...	...
L_3	48	12	...	...	...	...	...	25·0	..
Year 1913.									
L_1	50	...	1	1	1 (hoven)	12	...	...	2
L_2	50	...	...	2	...	10	...	..	4
L_3	50	...	...	2	...	14	1	...	4
Year 1914.									
L_1	46	1	...	...	...	11	...	2·17	...
L_2	47	...	...	1	...	6	...	...	2·12
L_3	47	3	...	1	...	12	...	6·38	2·12

No records are available for 1911, but taken collectively we have those for the three remaining years from which to make comparisons.

Mentioned in order of breed, the percentage of ewes assisted and those that died in the Lincoln group were 1·4 and 0·7 per cent. respectively. In the Leicester group none were assisted, but 2·05 died. Those with the Border Leicester show a percentage of 10·3 assisted and 2·06 as having died.

In perusing these figures, attention might be drawn to the fact that the majority of ewes recorded in the case of the Border Leicester were for the year 1912, when the major portion of the draft comprised maiden ewes. The practice of placing the identical group of ewes with the same breed of ram they were mated with in the first instance was adhered to year after year. It is therefore of further interest to note that no ewes were assisted in the case of either breed the following year (1913) when a year older.

It may be considered that results from comparatively so few ewes could hardly be expected to confirm or otherwise detract from the merits of the respective breeds in this particular. The corresponding figures for Wagga and Cowra will be of interest.

Typical Lambs of the Lincoln-Merino Cross.

The figures for Wagga are as follows:—Lincoln group: number assisted, 8·9 per cent.; number died, 1·58 per cent. Leicester group: assisted, 3·96 per cent.; died, 5·16 per cent. Border Leicester group: assisted, 7·7 per cent.; died, ·4 per cent. The results for the Cowra Farm were:—Lincoln group: assisted, 1·95 per cent.; died, 3·06 per cent.; Leicester group: assisted, 1·95 per cent.; died, 2·25 per cent. Border Leicester group: assisted, 3·34 per cent.; died, 2·78 per cent.

Thus, for the four years' records at Wagga and Cowra, and from the three years' figures from Bathurst, we obtain the following averages:—

Lincoln Group.					Leicester Group.					Border Leicester Group.				
No. of Ewes.			Percentages.		No. of Ewes.			Percentages.		No. of Ewes.			Percentages.	
Mated.	Assisted.	Died.	Assisted.	Died.	Mated.	Assisted.	Died.	Assisted	Died.	Mated.	Assisted.	Died.	Assisted	Died.
750	31	17	4·13	2·26	756	17	24	2·25	3·17	751	46	14	6·12	1·86

Although the point may be regarded as only incidental, the above results have, nevertheless, a significant bearing on the rate of natural increase. Any one breed might show to advantage in the production of those qualities for which the breeds are being primarily tested. If, however, the standard rate of increase be below the average of others with which it appears in competition, that breed must necessarily suffer by comparison. The significance of the lambing table may therefore be more easily understood when analysed in conjunction with the rate of natural increase.

Cross.	No. of Ewes mated.	No. of Lambs Marked.	Percentage of Lambs.	Seasonal Conditions.
			Year 1911.	
L_1M ...	42	19	45·24	The rainfall for the year was 22·47 inches. Heavy falls were experienced in January, but a protracted dry spell intervened during the lambing period The following shows the distribution :- January, 713 points; December, 254 points, leaving only 1,280 points for the intervening months.
L_2M ...	41	16	39	
L_3M ..	41	22	53·66	
			Year 1912.	
L_1M ...	47	34	72·34	The rainfall for the year was 17 inches, being 6½ inches below the average. During the second and third quarters the sheep were hand-fed. Drought conditions prevailed until June; 1,022 points were then recorded during June, July, and August.
L_2M ...	49	32	65·30	
L_3M ...	48	30	62·50	
			Year 1913.	
L_1M ...	50	35	70·	The rainfall for the year was 19·79 inches, which was more evenly distributed than the preceding year; 12·41 inches fell during the first half, which was favourable to the lambing.
L_2M ..	50	41	82·	
L_3M ..	50	31	62·	
			Year 1914.	
L_1M ...	46	37	80·40	The rainfall for the year was 22·51 inches, 9·33 inches of which was registered during the first six months, whith gave the crops a good start, and provided good feed for the lambing,
L_2M ...	47	36	76 60	
L_3M ...	47	38	80·80	

The combined percentages for the four years at Bathurst are :—Lincoln group, 67·57 ; Leicester, 66·84 ; Border Leicester, 65·03. The results, taken for the whole period, are fairly uniform, and are well within the range of experimental error, the season apparently being a more important factor in determining the rate of increase than the breed. The following summary of the combined results at the three farms is of interest :—

Lincoln Group.			Leicester Group.			Border Leicester Group.		
No. of Ewes mated.	No. of Lambs marked.	Percentage.	No. of Ewes mated.	No. of Lambs marked.	Percentage.	No. of Ewes mated.	No. of Lambs marked.	Percentage.
792	480	60·6	797	530	66·5	792	483	60·9

These results favour the Leicester. In the parturition table this group showed the least number of ewes assisted, but shows a slight increase over the other groups in the percentage that died, although this did not amount to more than 1 per cent. The total results in this case are in harmony with the main structural features and general conformation of the breed, as was pointed out in the Wagga report. When dealing with the question of difficulty at parturition, it was explained that the head of the Leicester was smaller than that of the Lincoln and Border-Leicester. It was also pointed out that although the shoulders are full, in conformity with the shape of the head, the neck is shorter, and the outline generally less preponderant and cumbersome than in the other two breeds. The lambs, too, are smaller at birth than those of either Lincoln or Border Leicester, as the body weights indicate.

Typical Lambs of the Border Leicester-Merino Cross.

The table showing the rate of increase certainly points to the Leicester group as being the most prolific of the three under observation, but we would hesitate before committing ourselves to definite conclusions on this point. But taken over several years, and recorded from three distinct centres, they should serve for all comparative purposes as a fair indication of the disposition to breed, so far as it is possible to assemble reliable data on the point.

The Lamb Stage.

We now approach what appears the more important part of the investigations, namely, the recording of the wool and mutton values. Here the progeny is first seen as a marketable commodity, but whether it be disposed of at this juncture or held till a more advanced stage, really rests with the breeder, who must be largely influenced by local conditions. The variability of the season, or of the district, the extent to which an area might be stocked, and many other such considerations, may so alter cases as to force one breeder on to the market while another would be in a position to hold.

It may, however, be rightly contended that the lamb is not the most profitable stage at which to market types bred primarily with the object of producing in the maximum proportions both wool and mutton, and especially does this refer to strains combining Longwool and Merino blood.

Marketable lamb types may be raised from second crosses, but first-cross dual-purpose wool and mutton types require a longer period during which to develop these qualities.

For more convincing proof as to the value of the different crosses, the records will require to be analysed for the later period of development. In order, however, that comparisons may be made at all stages, we present the figures here for what they are worth.

Two sets have been compiled—one showing a record of monthly development from birth, while the other gives the results at the first shearing and distinguishes between body and fleece weights separately.

TABLE showing Monthly Development of Lambs up to the weaning stage.

Cross.	Sex.	No.	Body Weight.			
			4 weeks old.	8 weeks old.	12 weeks old.	16 weeks old.
Year 1911.			20th July.	20th Aug.	20th Sept.	20th Oct.
			lb. oz.	lb. oz.	lb. oz.	lb. oz.
L_1M	W. & E.	19	20 14	31 10	45 15	57 14
L_2M	,,	16	20 9	30 14	45 2	57 9
L_3M	,,	22	21 0	30 13	46 9	58 9
Year 1912.			19th July.	19th Aug.	20th Sept.	19th Oct.
L_1M	W.	14	17 0	24 8	34 4	43 6
...	E.	15	16 8	22 4	31 2	41 4
L_2M	W.	11	18 8	25 4	34 12	42 10
...	E.	11	16 12	23 0	31 5	42 4
L_3M	W.	8	19 2	27 12	37 6	49 4
	E.	12	17 5	26 9	34 4	45 6
Year 1913.			29th Aug.	30th Sept.	23rd Oct.	4th Dec.
L_1M	W.	6	45 2	61 0	70 11	75 15
	E.	26	42 2	57 10	66 9	68 4
L_2M	W.	6	45 5	63 1	71 13	72 5
	E.	19	45 0	60 7	67 13	71 1
L_3M	W.	6	47 10	66 8	74 1	84 1
	E.	18	43 9	64 1	69 12	76 7
Year 1914.			11th Aug.	11th Sept.	11th Oct.	17th Nov.
L_1M	W.	17	31 9	46 1	57 6	66 2
...	E.	19	31 13	45 4	54 0	63 9
L_2M	W.	13	31 10	47 1	57 15	64 11
...	E.	21	30 1	45 4	57 2	65 0
L_3M	W.	14	31 7	47 15	63 11	71 4
	E.	19	30 5	44 7	59 6	68 6

The effect of the season is well indicated on comparing the averages, one year with another. The year 1912 was a particularly lean one, as may be noticed from the results. The sheep, however, were kept under identical conditions throughout, so that so far as the records are concerned no one breed was favoured more than another.

The merits of the different crosses from the present standpoint may, however, be gauged from a comparison of the combined averages, which, for the four years stated, are as follows:—

Cross.	Weight. lb.	oz.
L_1M	59	9
L_2M	60	4
L_3M	64	9

Taken conjointly with those already summarised for the corresponding periods at the Wagga and Cowra Farms, we get the following combined return:—

Cross.	No.	Weight. lb	oz.
L_1M	463	63	1
L_2M	492	60	14
L_3M	453	64	8

These results speak for themselves, but they would be incomplete unless amplified by further particulars showing the relative portions of body and wool weights. It should, however, be noted that the lambs were scarcely four months old when shorn, and that shearing took place usually between the third and fourth weighing. This accounts for the apparent slower rate of development recorded at the final weighing as compared with the period covering the preceding month, also for the lower average wool weight compared with that recorded for the other farms.

TABLE showing Body and Fleece Weights of Lambs of different cross and taken on the average at the $3\frac{1}{2}$ months.

Cross.	Sex.	No.	Average Weights. Body. lb.	oz.	Fleece. lb.	oz.
Year 1911.	Date of Shearing, 17th October.					
L_1M ...	Wethers and Ewes ...	19	54	15	2	15
L_2M ...	,, ,,	16	54	2	2	13
L_3M ...	,, ,,	22	56	0	2	9
Year 1912.	Date of Shearing, 1st November.					
L_1M ...	Wethers	14	47	8	1	15
	Ewes	15	47	9	1	13
L_2M ...	Wethers	11	46	12	1	13
	Ewes	11	48	4	1	14
L_3M ...	Wethers	8	55	0	2	1
	Ewes	12	50	0	1	15
Year 1913.	Date of Shearing, 26th October.					
L_1M ...	Wethers	6	67	3	3	8
	Ewes	26	62	14	3	11
L_2M ...	Wethers	6	67	15	3	14
	Ewes	21	64	10	3	3
L_3M ...	Wethers	6	71	0	3	1
	Ewes	17	66	14	2	14
Year 1914.	Date of Shearing, 26th October.					
L_1M ...	Wethers	19	53	14	3	4
	Ewes	17	54	9	3	3
L_2M ...	Wethers	13	55	0	3	2
	Ewes	21	53	4	3	1
L_8M ...	Wethers	14	68	3	2	11
	Ewes	19	54	0	2	12

Taken separately we find the crosses giving the following average :—

Cross.	No.	Body.		Fleece.	
		lb.	oz.	lb.	oz.
L_1M	116	55	4	2	15
L_2M	99	57	0	2	13
L_3M	98	59	13	2	9

With the above information at our disposal we are now enabled to complete the results up to this stage, and worked for the three farms, and for four years' work at each, the following compilation may be accepted as a fairly reliable record of the respective merits of the crosses under review :—

Cross.	No.	Body.		Fleece.	
		lb.	oz.	lb.	oz.
L_1M	366	61	0	3	8
L_2M	403	59	9	3	2
L_3M	374	62	9	2	15

(*To be continued.*)

CONTROL OF PEACH LEAF CURL AT YANCO EXPERIMENT FARM.

In connection with the above, experiments have been carried out for the past two years on a block of Elberta peach trees with lime-sulphur solution, with a view to ascertaining the best time to apply the spray. The spraying was done during three periods of the season, viz., No. 1 whilst the trees were perfectly dormant; No. 2 when the buds were swelling; and No. 3 just as the blossoms were at the pinking stage. Experiment No. 1 gave the best results, as out of the twenty-one trees sprayed only an occasional leaf developed the disease. In experiment No. 2, a fair proportion of the foliage was affected. Experiment No. 3 was affected even more so than No. 2.

In connection with the spraying at the dormant period, a check row of twenty-one trees was sprayed twice—once at the dormant stage, and again when the sap was moving; and as the results of No. 1 experiment proved so effective, it was unnecessary to have applied the second spraying, although it would be advisable to spray twice if the trees were badly diseased the previous season. Check trees left unsprayed through the block in every case developed the disease badly. Spraying at the dormant stage was also somewhat effective in controlling rust, as the early or dormant sprayed trees showed very little signs of this disease, whilst those sprayed later, or when the sap was moving, developed rust to a marked degree.

In all cases the lime-sulphur solution used was home-made, and prepared according to the departmental formula, and applied freshly made, *i.e.*, not stored subsequent to making. On every occasion the solution was either made on the same day, or not more than twenty-four hours previously.—W. J. ALLEN.

Manures in Relation to Vines.

H. E. LAFFER, Viticultural Expert.

It may safely be said that, so far as Australia is concerned, the important question of systematically manuring vineyards has received but scanty recognition up to the present time.

A certain amount of work has been done in this direction by the more enterprising growers it is true, but so far there has been very little consistent experimental work carried out. Unfortunately, it would seem that much that has been done has given apparently negative or contradictory results, and it has therefore not been persevered with. In order to arrive at an equitable basis from which to draw conclusions, it will be necessary to compile reliable data extending over a number of years of experiment. In the older vine-growing countries of the world, manuring forms a regular portion of the annual cultural operations, and it is only a matter of time when Australia will have to fall into line and recognise the importance of maintaining and increasing the fertility of vineyard soils. In fact, it may be said to be of vital importance in a country where the cost of labour, coupled with relatively high cost of most things used in the production of wine, is set against a comparatively low return per acre. Any system which aims at the production of heavier yields of grapes and wine from smaller areas is worthy of full consideration by the grower.

Australia is but a young country as yet, so far as its branches of primary production are concerned, and although results obtained from its vineyards up to the present have been excellent, these will improve as time goes on and science is brought more generally into application in the production and maturing of our wines.

The vine is a deep-rooted and a long-lived plant, and thus it may be many years before it is able to exhaust the available fertilising elements in the soil, but the time surely arrives when the gathering of the necessary plant food becomes more difficult, and it is then that assistance through artificial sources will reinvigorate the plant.

Although we have certain rules to guide us in the practice of manuring, no hard-and-fast rule can be laid down under general conditions. The success attending the practice must depend upon local factors such as climate, soil, and the amount of available moisture present in the soil. Probably the last-named is the most important, for unless there is ample moisture to make the manures available and to transmit them through the system of the vine, there can be little or no result.

Vines in common with all plants require certain elements of plant food which bear a definite relation one to another in the different plants under consideration. According as this relationship as to quantity and availability is deranged, so is one or other part of the plant affected. Those elements representing the mineral portion of the plants' food, and derived directly from the soil, are more or less abundant in all cases. For some years, according to the natural fertility of the land, they are conducive to luxuriant growth, but in most cases there comes a time when the vine has to do a great deal more searching with its root system before its needs are supplied. It does not necessarily follow that the supply is exhausted, but rather that the available portion of the plant food is used up. There still remains what we may term the "latent fertility" of the soil, consisting of more or less insoluble compounds, the splitting up of which by natural agencies may be a comparatively slow process, and the needs of the plant are supplied only with difficulty. Such conditions are plainly apparent in weakened growth, impoverished bunches, and an aspect of general debility in the vine. It follows then that if the existing framework and normal production of the vine are to be maintained, some method of nourishing it and making good the deficiency of food must be evolved.

The best quality wines are always produced from land which may be looked upon as being relatively poor, and naturally the returns from such soil are low in comparison to those obtained from alluvial soils and rich flats. In this connection manuring of vines was opposed in Europe by growers in certain areas where very small yields of wine were the rule but for which fabulous prices were obtained because of its rarity and quality, the contention being that, as the fertility of the soil was improved by the application of manures, it came nearer in type to the more productive soils, and in consequence the quality of the resulting wine would deteriorate. This contention takes into account only one factor, namely, the amount of available plant food present, but disregards the fact that neither the climate nor the available water supply are affected. These, after all, are the decisive factors influencing the vegetative development of the vine. In any case, whether there is any justification for this contention or not under those peculiar circumstances, we in Australia need never concern ourselves over the matter.

The main elements of plant food required by the vine are phosphoric acid, nitrogen, potash, and lime, and these are absorbed in such quantities as to render the exhaustion of the available supply a reasonable possibility. Other substances of minor importance, such as iron, magnesia, &c., are used to such a small degree that there is little diminution in the available supply. Lime may be looked upon more in the light of a corrective than a plant food, and full reference to it will be made further on. Thus we find that any system of manuring resolves itself into a question of profitably applying substances of a nitrogenous, phosphatic, or a potassic nature to the soil.

Speaking generally, it may be said that sickly vines produce poor quality fruit and light crops, and in order to maintain quality and quantity, manuring is deserving of every consideration where vines exhibit any inclination to weakness and low yields. Diminished yields from debility represent a loss in value of the crop which would fertilise the vineyard for some years. It is easier to maintain vigour than to renew it once the vines have been appreciably weakened.

It is estimated that vines will remove annually per acre from the soil, approximately 40 lb. of potash, 45 lb. nitrogen, and 10 lb. phosphoric acid, and it would appear only reasonable to replace at any rate a portion of this each season.

Nitrogenous Manures.

Of this class we have two types—those of organic and those of inorganic or mineral origin. The former is derived from decayed organic matter of any description until, through decomposition and nitrification processes, it becomes incorporated with the soil.

It supplies, during the processes of decay, that all-important soil constituent, humus, which is so necessary, not only as a source of fertility, but as a means of increasing the moisture-retaining capacity of the soil. This is a very important factor in the manuring of Australian vineyards, and any system which will serve to this end cannot be other than advantageous.

Unfortunately, except for limited areas, the use of stable or farmyard manure is out of the question, owing largely to the fact that supplies are not available. Where this commodity can be obtained, even if its use is restricted to small areas, its value as a fertiliser and an improvement to the physical nature of soils cannot be overestimated. It supplies not only humus, but on the decomposition of its substance quantities of all the essential fertilising elements are liberated. Incidentally, its presence in the soil makes for freer working and raises the degree of moisture which the soil is capable of retaining.

For areas of any extent, then, we may say that farmyard manure is out of the question, and if it is desired to add to the humus percentage of the soil we must have recourse to some other method such as green manuring.

Green Manuring.

This is a practicable proposition even on large areas, and, described briefly, it is a system which consists in growing some crop of green succulent matter between the rows of vines and ploughing it under at a suitable time. Generally speaking, the crop is sown in the autumn and ploughed under in the late winter.

When it involves only a matter of humus, any quick-growing crop which will give a dense growth may be used, but as a rule one or other of the legumes, such as peas, vetches, or beans, is employed, as being in themselves nitrogen-gatherers as well. In most cases the crop chosen is field peas, as being the most suitable for a variety of conditions.

As a fertiliser to the crop for its immediate needs, superphosphate is applied at the time of sowing, and as the legumes require quantities of potash, if the soil is deficient in this substance, some form of potassic manure is beneficial. The alternative to this is to apply a dressing of gypsum, which has a beneficial effect, especially on the heavier soils. As a general rule the green crop will do well without the potash manure.

Ploughed in just about flowering time, or at any rate before conditions of climate become too dry, the substance of the crop decays rapidly and becomes incorporated with the soil. It undergoes rapid nitrification in the lighter soils, becoming transformed into mineral nitrates before it can be assimilated by the plants. On the lighter class of vine-growing land, particularly on irrigation areas, green manuring is a practice which has much to commend it. In conjunction with the superphosphate it represents the equivalent of good farmyard manure, with the added advantage that the mass decays readily by reason of its soft green condition.

Mineral Nitrates.

As the principal examples of mineral forms of nitrogen, we may take ammonium sulphate and sodium nitrate, both of which are very active agents in encouraging vigour of growth. The cost of both is relatively high, and therefore the quantity applied per acre should be the minimum required to obtain a payable increase of crop. No hard-and-fast rule can be laid down with reference to the quantities to be used, and there is practically no data for Australian conditions upon which we can base deductions. It can be determined by experiment upon any particular soil under consideration. Results taken from carefully tabulated figures, extending over a number of years, are the most reliable guide. As a basis for working upon, quantities varying from 1 to 2 cwt. per acre may be tried, and, for preference, this should be sown in the early spring.

Nitrogen is productive of vigour and dense foliage in the vine, and care should be taken that this should not be so excessive as to upset the balance between wood production and fruit production. The vine derives its carbonaceous matters from the atmosphere, and, provided other conditions are favourable to growth, it is often astonishing how well vines will do in soils which are comparatively deficient in nitrogen.

Potassic Manures.

Whereas the nitrogenous or carbonaceous substances, which are absorbed by the vine or tree, are utilised in building up the foliage and woody structures, potassic elements are concentrated almost entirely in the fruit. This is especially so in the grape, where the juice is highly charged with potassic salts—the chief form being acid potassium tartrate or cream of tartar. The whole of the commercial supply of this commodity is derived from the wine industry.

Thus we can understand that potash is very necessary to the vine, and soils which are rich in this respect are noted for their heavy production of fruit. Most of our soils are plentifully supplied with potash although it may not be readily available for the use of the plants.

Potash in the form of sulphate or chloride (muriate) is expensive, and at the present time difficult to obtain. As already stated, most soils, except those of a light sandy nature, contain good reserve supplies which nature appears to have placed in such a form that there can be no rapid wastage.

In practice, then, it is only necessary to supplement the available supply with a small quantity of a quickly soluble potash compound, either sulphate or muriate. Potash is assimilated by the plants in the form of carbonate, and therefore the above-mentioned forms must undergo reversion to the carbonate in the soil.

Heavy soils, although they may be rich in potash compounds, are frequently in a form which renders them unavailable, in which case some corrective treatment is required to bring them within reach of the plants. For this purpose gypsum (calcium sulphate) is of great benefit.

In nature, potash is held in the surface layers of the soil in the form of carbonate, with the result that deep-rooted plants are unable to secure supplies. This applies more particularly to the heavy or clay soils. The dressing of such a soil with gypsum brings about a chemical reaction between potassium carbonate and the calcium sulphate, resulting in the formation of calcium carbonate on the one hand and potassium sulphate on the other. The former is insoluble and the latter readily soluble in water. The potassium sulphate, in solution, is carried down to the deeper layers of the soil, but in this form it is not used by the plant. Another reversion must first take place, brought about by the presence of soil acids and carbonic acid. Potassium sulphate becomes sulphide, an unstable compound which is easily converted into the carbonate. Thus we have the potash salt in an available form, and in a position where the roots can absorb it.

Potassic manures, in promoting heavy crops, constitute a greater strain on the energies of the vine, and therefore it is necessary to assure an adequate supply of other plant food elements in order that the general constitution will be maintained. Quantities of ½ to 1 cwt. per acre should be sufficient in most cases to supplement the natural supply. The best time of application is in the late winter, or when vines are being irrigated.

Phosphoric Acid.

Whereas potash and nitrogen are of more particular benefit to the fruit and vegetation respectively, phosphoric acid appears to be more general in its influence upon the vine. It conduces towards the general health of the vine, and is said to have an important influence upon the ripening of the wood. Australian soils generally are deficient in phosphates, and so far as artificial manures are concerned, all results up to the present time indicate that phosphoric acid is the most necessary food required. Phosphatic manures are readily obtainable at a comparatively cheap rate, and the only difficulty would appear to lie in the mode of application, a question which depends upon the nature of the soil. It has been demonstrated that soils of a heavy nature have the power of retaining phosphoric acid in the surface, and therefore, in such soils, it is preferable to place the phosphate as deep down as can conveniently be done. This can be accomplished by distributing it in the bottom of the plough furrows and covering. In the lighter soils of a sandy or gravelly nature, more particularly upon irrigated lands, it appears to be sufficient that the manure is drilled in upon the cultivated soil, which affords free percolation. It is in the lighter soils that phosphatic manures have given the quickest and best results so far, and, particularly where irrigation is practised, beneficial results should follow their application.

For general conditions superphosphate is most suitable, and may be used at the rate of 2 to 4 cwt. per acre. It is rapid in its action, and easily applied. For moist conditions, bone-dust is good, as being of a more lasting nature, but not so active.

Lime and Gypsum.

These represent what may be termed "improvers" or "correctives" to the physical nature of soils. The uses of gypsum have already been referred to in their action upon the potash compounds.

Few of our soils contain insufficient lime to supply the actual needs of the plant, but it is in its action upon the physical nature of soils that lime plays its most important role.

Upon heavy clay soils, more or less impermeable to water, lime flocculates the clay particles, makes the soil work more freely, and opens a passage for the water to escape. Roots of plants develop more freely, and more or less insoluble compounds are broken up into simpler forms. Applications up to 2 tons per acre have a very beneficial effect upon the texture of the soil.

On sour or swampy land, lime destroys the acidity, sweetens the nature of the soil, and makes it more capable of sustaining healthy plant life.

Lime is obtainable in three forms—

1. Ground limestone (calcium carbonate).
2. Quick-lime (the above form burned).
3. Slaked lime (the quick-lime which has undergone reversions to the carbonate from exposure to the air).

All three have their uses, but quick-lime is the most active in its effect upon clay soils and upon soil compounds.

Gypsum is not so active as an alterative to the texture of heavy soils, but at the same time it has a considerable physical effect, tending to make the land work more freely.

SIX RULES FOR PREVENTION OF FIRE IN GRAIN FIELDS.

THE College of Agriculture of the University of California have issued the following recommendations to wheat farmers:—

1. Keep your machinery in repair, well lubricated, and provided with an air clarifier and a good spark arrester. Hot boxes and hot carbon cause 30 per cent. of grain fires.
2. Always have at hand on the harvester at least two good chemical fire extinguishers. They keep little fires from growing up.
3. Don't smoke in the fields. Tobacco may be satisfying, but it's hot.
4. Break up big fields by cutting hay strips at intervals while grain is green. These give you a chance to fight and confine fire to a small area.
5. Plough several furrows around your grain field as a fire break. Your neighbour may not be as careful as you are.
6. Help organize your community and instal fire fighting equipment at convenient points. Get ready now. After a fire starts it's too late.

Some Observations on the Internal Parasites of Live Stock.*

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In this address it is not my purpose to go into details of treatment or the diagnosis of animal parasites in stock, but to take a general survey of the subject in order to provide material for thought at leisure. The choice of the subject needs no apology when one realises that the loss occasioned to the live stock industry by these pests is, in this country, always considerable, even in good seasons; but during the unusually wet conditions some districts have been experiencing recently, losses have occasionally been pronounced. Furthermore, although this may appear at first sight a paradox, drought conditions a few years ago were responsible for the occurrence of parasitic diseases in stock, especially sheep, in localities where such diseases are usually absent, the reason for this being that during drought, stock were removed from the dry districts to places where feed was obtainable. Naturally these areas were such as are usually moist. Here the animals became infested with internal parasites, and on their return, carried back with them such parasites to places where trouble from them is usually of little economic moment. The consequence of this is that one must expect to get reports of losses from internal parasites from such areas for the next few seasons until normal conditions have obtained again.

When the value of live stock was low, and their numbers considerably above that at present, direct or indirect loss due to these parasites may not, generally speaking, have caused any very great concern to the owners; but at the present time, when circumstances are reversed, *i.e.*, prices high and numbers comparatively low, no loss, no matter what the cause may be, can be viewed with equanimity, or looked upon as merely part of the inevitable strokes of misfortune which befall owners of live stock.

When we consider the economic loss, direct to the owner, indirect to the State, either from actual death of stock, or impaired constitution of the survivors, due to such things as stomach worms, liver fluke, lung worms, &c., and which losses are in some places so common that the stock-owner concerned looks upon them as unavoidable trials, except when the mortality is unusually heavy or trouble occurs in a fresh area, I think we are all agreed that the more one knows about the lives of these various parasites, and the conditions under which they thrive best, and are able to maintain

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their existence in face of the undoubted handicaps to which they are subject, and the way in which they produce ill effects upon the animal in which they take up their abode, the more valuable will be our services to stock-owners and to the State.

It may be borne in mind that the majority of the internal parasites harmful to stock are not recent importations. They were probably brought into the country in the early days of its history, with animals from various parts of the world; and, just as people continually living in the midst of a danger become accustomed to it, so, as before-mentioned, owners have in some degree grown accustomed to the presence of internal parasites in their stock, and no publicity is given to the fact except when something unusual occurs.

Before proceeding with the subject, I would impress upon you that conditions in Australia are widely different from those obtaining in Europe, and what might be relatively easy to do in one country would be quite impracticable in the other, in connection with the prevention and cure of parasitic diseases of live stock. There is, however, one thing in favour of prevention here which is usually not obtainable in Europe, viz., on account of the large holdings in Australia, it is often possible to move animals from badly-infested spots to cleaner ground, whereas in Europe that is often difficult to accomplish. On the other hand, individual treatment is quite practicable in Europe. In this country such a thing is, as a rule, quite impracticable. These factors should be remembered when hearing of or reading about the cure of internal parasitic diseases in Europe.

In a general discussion of the subject, one has to remember that parasites are such because they have found that it suits them better to live upon other beings than to prepare their own nutriment, and that their bodies and their mode of propagating their species have become modified to meet the conditions under which they live. When one considers the process of evolution, one must think of it in its downward as well as in its upward direction, and to look upon parasites of the type we are considering as degraded forms of life, although they have become highly specialised for their particular mode of existence. Such processes are slow, and have taken very long periods to accomplish. Internal parasites are not new beings. Some of them were known and written about by the ancient Egyptians. Some of these organisms are not absolutely parasitic, *i.e.*, they can live and multiply apart from the living host; but others, and these are the ones which mostly concern us, are true parasites, *i.e.*, they have reached a stage in their evolution in which the existence of the species cannot be maintained apart from the living animal, and therefore, when the host dies, they die also, unless a fresh host can be found. There are no doubt a number of species of parasites living in or on the animal body without giving rise to any apparent disturbance to the health of their host. It is, however, my intention to confine myself to those which are the cause of more or less serious interference with the health of the animals in which they have come to reside.

Where the Parasites locate themselves.

In making a general survey of the internal parasites infesting animals, one is struck by the fact that certain parasites have become accustomed to taking up their abode in certain parts of the animal body, in which to pass that stage of their existence, *e.g.*, the nasal chambers of sheep for *Œstrus ovis*; the anterior chamber of the eye of poultry for Manson's eyeworm; the liver for the liver fluke; the blood vessels of the dog for *Filaria immitis*; the lungs for certain round worms; the paunch or rumen for *Paramphistomum conicum*; the true stomach for some other species of worms; the peri-renal tissue of pigs for *Stephanurus dentatus.* These are only a few of the many examples one might cite.

Another important feature is that in some cases the harm is occasioned by a certain parasite in its mature stage, whilst in other parasites it is one of the transitional stages which is responsible for the mischief, *e.g.*, the round worms of the lungs and stomach; here the adult individual is the immediate cause of the trouble. Examples of immature parasites are: the *larvæ* of flies, *e.g.*, *Œstrus* and *Gastrophilus*; the bladderworms, *e.g.*, Hydatids: also *Trichinella* and *Cysticerci.*

How they cause Injury.

We have now to consider the method by which such a variety of parasites cause injury to their hosts. This varies very considerably, and naturally the manifestations of such injury depend greatly upon the situation. The following are illustrations of the various injuries inflicted:—

1. Direct injury by pressure upon the central nervous system, *e.g.*, the pressure on the brain by the Gid parasite, which is the bladderworm stage of a tapeworm.
2. Injury during the migration of the embryo parasite from the bowels to its resting place, *e.g.*, the *Trichinella spiralis,* responsible for the disease known as trichinosis.
3. Local injury by irritation, *e.g.*, *Œstrus ovis,* the larva of a fly, in the nasal chambers of sheep.
4. Injury to blood vessels, *e.g.*, *Sclerostomes* in horses, and *Filaria* in dogs.
5. Injury by pressure on and destruction of important tissues, *e.g.*, hydatids.
6. Injury by destruction of tissues accompanied by serious obstruction to the performance of the functions of the organ attacked, *e.g.*, liver fluke.

Then there are examples where the injury is both direct and indirect. This is very well seen in the case of infestation by stomach worms in sheep and cattle. Here the evidence of the direct injury is seen in the inflamed stomach and the diarrhœa, the indirect injury in the profound anæmia and wasting which accompanies the condition.

An interesting feature in parasitism in general is that in some cases it is not in the interests of the parasite that it should destroy its host, for in this case the particular parasite would die out also. In other cases, the death of the intermediate host is essential before the parasite can complete its life cycle, *e.g.*, in the case of the hydatids or bladderworms, the flesh of the intermediate host has to be eaten by the final host, usually another species of animal, before the parasite can reach maturity.

The Life History of Internal Parasites.

In order to be able to cope intelligently with the invasion of parasites, a knowledge of their life history is necessary. I do not mean by this to insist that every stock-owner must be in possession of this knowledge before he can hope to accomplish anything, although this would be very advantageous to him, but that his advisers must be. Towards this end points of great value are—(*a*) whether the particular parasite spends the whole of its existence in one species of animal, or whether several different species are necessary for its propagation; (*b*) whether its life cycle is a simple one, as in the stomach worms, or a complex one, as in the liver fluke?

In connection with the lives of the internal parasites, one has to bear in mind that the obstacles to the continuation of their species are many, and only relatively a few reach maturity. Consequently, in order to provide for a high death-rate in the young parasite, it is found that as a rule the female possesses a high degree of fecundity, very large numbers of eggs or embryos resulting from one fertilised female. Again, in the case of parasites having a simple life cycle, it is necessary that the eggs or embryo should be protected between the time it leaves its parent host until it finds another in which to mature. One finds such protection provided in various ways, *e.g.*, the egg being provided with a very resistant covering; a similar protection may exist in the larva also; the longevity of the larva.

Certain geographical and climatic conditions favour the survival of parasites, but these cannot be viewed as being under the control of the latter.

The Effects of Internal Parasites on Animals.

In considering the effects produced by the invasion of internal parasites, several factors become evident, *e.g.*, the number of parasites present has a great bearing on the result upon the animal. In most cases the presence of a few such parasites causes no appreciable harm, and in quite a number of districts harmful parasites may be found in their predilection seats in live stock, *e.g.*, the alimentary tract of cattle and sheep, but the conditions under which the host animals are living are such that the parasites are unable to multiply to an injurious extent. Such conditions may be seen in large grazing areas, not overstocked, with well-drained paddocks and animals in good condition, especially with a dry climate.

In other places the intermediate host necessary for the parasite to complete its life cycle in is absent, consequently its propagation is checked, *e.g.*, fluke in a district where there are no water-snails.

Again, in some instances, age is a great factor in the results due to parasitic invasion. Especially does one see this in the case of stomach worms in cattle and sheep and other intestinal parasites. In the former condition, the young animals suffer much more seriously as a rule than adults; also, an animal whose vitality is weakened by age, want of proper nutriment, bad hygienic surroundings, continual wet weather, &c., is much more likely to become a victim than one which is living under conditions unfavourable to the continued existence of the parasite.

I have indicated that the injurious effects produced by such parasites are in the main due to mass action, *i.e.,* many parasites must be present before the animal host shows any appreciable change in health. Consequently, the overstocking of pastures, or the continual grazing of the animals over spots where the parasites are voided in the excreta of infected animals (and the two conditions, overstocking and continual feeding over the same ground, are by no means synonymous), or the drinking of water heavily contaminated with eggs or larvæ of parasites must be looked upon as great factors in the spread of internal parasites, and the ill-health of their hosts.

To emphasize my point that overstocking is not always the cause animals grazing over infested ground. Everyone is aware that a paddock may be very large, and provide ample grazing area for the stock in it, yet sometimes one finds in such a paddock a small area, especially a swampy part, where the animals prefer to graze. Such parts will naturally be more heavily covered with the excreta of the animals, and when moist or swampy will act as a reservoir for the reinfestation of animals with intestinal and other parasites.

A General Survey of Internal Parasites.

We now come to a survey of particular internal parasites of animals. The first to be mentioned are what are popularly known as bladderworms. These are the immature or intermediate forms of tapeworms, and they represent a stage in the life cycle of particular parasites. They get their names from the bladder-like appearance and watery contents of the cyst. A fact to be remembered when dealing with this particular kind of parasite is that the bladderworm stage is passed in one species of animal, whilst in most cases the mature form or tapeworm is found in quite a different species, consequently one may look upon the animal harbouring the bladderworm stage of the parasite as the passive host, whilst that harbouring the mature parasite as the active host.

It is very interesting to note that in most of the cases in which the life history of this particular kind of parasite of live stock has been worked out, the animal harbouring the mature tapeworm is the dog or dingo. Now, numerous tapeworms of horses, sheep, and cattle are known, and no doubt all of them have a bladderworm stage, which is passed somewhere else; but up to the present very little is known of the life history of the tapeworms of cattle, sheep, and horses.

Of the groups of bladderworms, three are of importance to live stock, viz. (1) *Cysticercus*; (2) *Cœnurus*; (3) *Echinococcus.*

Examples of the first group are: (*a*) *Cysticercus bovis* and *C. cellulosæ,* in the ox and pig respectively. The mature forms are tapeworms in man. (*b*) *Cysticercus tenuicollis,* whose host is the ox, sheep, and pig; its adult tapeworm is *Tænia marginata* in the dog.

Examples of the second group are: (*a*) *Cœnurus cerebralis,* its host is the sheep, ox, and goat; the adult tapeworm is *Tænia cœnurus* in the dog. (*b*) *Cœnurus serialis,* seen in the rabbit; its adult form is another tapeworm of the dog, *Tænia serialis.*

The third group, *Echinococcus*; this bladderworm is the thing popularly known as Hydatid, although, strictly speaking, most of the various bladderworms are Hydatids.

Two species of *Echinococcus* are known; their hosts are the horse, ox, sheep, pig, dog, and man. The adult forms are yet other tapeworms of the dog, viz., *Tænia echinococcus.*

These examples show what a very important factor the dog is in maintaining and spreading bladderworms, although, as I have already mentioned, there are numerous tapeworms of other animals, the intermediate stages of which are very little known. However, so far as the foregoing illustrations are concerned, with the exception of the *Cysticercus bovis* and *C. cellulosæ,* of which man is the agent in propagating, it will be recognised that the rôle played by the dog and dingo is an essential one. The chain of events will be more readily followed when it is remembered that these two animals are meat-eating animals, and that their movements are, generally speaking, unrestricted.

Cysticerci.

C. bovis and *C. cellulosæ* give rise to what is popularly known as measly beef and measly pork. There is no record of the condition occurring in animals here, but it is common in some other countries. It will be readily understood that in countries where sanitary arrangements are absent, and animals live in contact with human beings, the spread of these particular parasites will be very easy.

Cysticercus tenuicollis is usually found in the abdominal cavity of its host, attached by a very long slender stalk, and containing a clear fluid. No particular harm has been observed arising from infestation by this bladderworm.

Cœnuri.

Of the two *Cœnuri* of animals, the most important is that found in the cranial cavity of ruminants, where it gives rise to a condition known as Sturdy or Gid. The other, *C. serialis,* is found in the subcutaneous tissues and muscles of rodents, *e.g.,* rabbits, where it is fairly common.

With regard to the bladderworm giving rise to Gid, the mode of infestation is by the animal, sheep or ox, swallowing eggs, which have become liberated from a ripe segment of the dog tapeworm, *Tænia cœnurus,* the dog voiding its excreta containing segments of the tapeworm about the paddocks, the excrement drying, and the eggs in it being blown about by the wind, &c., and coming to rest upon herbage, which is eaten by the animals concerned. The condition Gid is not common in New South Wales. The eggs having been swallowed by the animal host, the immature parasites hatch out in the stomach, bore their way through the stomach wall and travel to the brain. The parasite here comes to rest, and gradually secretes around itself a membrane in which fluid collects. The gradual growth of this cyst causes pressure upon the brain, and considerable nervous disturbance of the affected animal results. These brain disturbances, however, should not be confounded with nervous derangement due to a number of other causes.

Echinococcus.

The popular name for this bladderworm is Hydatid, but as I have already remarked, that term correctly may be applied to the bladderworm stage of a number of parasites.

The *Echinococcus* hydatid is the most common of the bladderworms of live stock in Australia, and it is so well known that I propose to say little about it.

It is the bladderworm stage of a very small tapeworm of the dog (*Tænia echinococcus*). The adult tapeworm is not more than one-third of an inch long; quite different from one's ordinary conception of the size of such parasites. Consequently, it can readily be overlooked when making a post-mortem examination of a dog. The bladderworms do not live for an indefinite period in the body of their host. Unless the latter dies naturally, or is killed, the bladderworm eventually dies itself. In the case of the *Echinococcus* hydatid, one often finds such dead parasites in the liver, &c., of animals, where they have degenerated, and frequently undergone calcification. Such degenerated hydatid cysts have not infrequently been mistaken for tuberculous lesions, but they can be readily differentiated microscopically.

Before leaving this part of my subject, I would again remind you that the dog is the active agent in the spread of the *Echinococcus* and a number of other hydatids, as it harbours the adult parasite or tapeworm. It follows, therefore, that if dogs were absent, these particular hydatids would become a thing of the past. Conversely, if dogs or dingoes were not permitted to eat raw flesh containing hydatids, the same thing would happen to the parasite. It is not practicable to get rid of all dogs, but to a very large degree it is practicable to prevent them feeding on uncooked hydatid meat.

The Cestodes or Tapeworms.

With regard to this group of parasites, the mature forms of the bladderworms, I have little to say. Their number is considerable, but as I have mentioned, very little is known of the intermediate life history of the tapeworms of horses, oxen, and sheep. At times heavy infestation has resulted in considerable mortality in young stock, notably in lambs. A few tapeworms do not cause the death of their host, although their presence must have a prejudical effect upon the animal's health. Sometimes one finds the bile ducts of the liver invaded with tapeworms from the bowel, and large numbers of certain tapeworms may be found in the liver.

Trematodes or Flukes.

The popular name for this group of parasites is fluke. Quite a number of species are known to exist in different animals in different parts of the world, but the one most commonly found affecting live stock in Australia is the liver fluke (*Fasciola hepatica*). Every year considerable economic loss occurs in various localities as the result of the activities of this organism. The liver fluke has a most complex life cycle. Part of it is spent in a small water-snail, part upon blades of grass, &c., whilst the mature stage is spent in the liver of animals, such as sheep and cattle. Even the foregoing brief note will help one to understand why fluke disease is more prevalent in wet, swampy districts than it is in dry areas. We say that in the case of the bladderworms, of which the dog is the final host, the death of the intermediate host animal, *i.e.*, the individual harbouring the bladderworm, is necessary for the propagation and maturation of the parasite; but with the liver fluke, the death of its host is not at all necessary for the propagation of the species. A liver fluke will lay about 30,000 eggs in the bile ducts of the sheep or ox. These eggs gaining entrance to the intestinal canal, and passing out with the excreta, give rise each to an embryo, which, however, soon perishes unless it can come in contact with its intermediate host, viz., a water-snail. It is hardly likely that more than a small fraction of embryos do reach a water-snail, and one again sees here a provision of nature for preventing the extinction of the race, viz., the enormous number of eggs produced by the mature individual.

It is interesting to note that the particular water-snail which is the intermediate host in Europe, is said not to exist in Australia. Here is another example of parasites adapting themselves to local conditions by finding another species of individual in which to pass part of their life.

Round Worms or Nematodes.

The parasitic round worms are responsible for very serious losses in live stock in this and other countries. Various species make their habitat in different parts of the animal body, *e.g.*, lungs, muscles, intestines, stomach, kidneys, subcutaneous tissues, &c.

Their life history is a comparatively simple one, although it differs in different genera. Broadly speaking, however, their cycle is that the two sexes, which are distinct, copulate, and eggs or living embryos are brought forth. In some cases no intermediate host is required for the propagation of the round worms of the domesticated animals, i.e., the eggs or larvæ pass direct to the same species of animal which harbours the adult worm. In other cases, however, part of the life cycle is spent in another host, *e.g.*, an insect or a mammal.

So far as the symptoms of infestation by round worms are concerned, the places that may be invaded are so numerous that no general account can be given, for naturally the symptoms shown by an infested animal depend upon where the particular species of parasite is accustomed to take up its abode. Generally speaking, however, when in a number of animals one observes a gradual loss of flesh without at first much loss of appetite, also unthriftiness, anæmia, and weakness, in the absence of any definite information to the contrary one may suspect the presence of worms.

As to curative treatment, here again it depends upon the situation of the particular parasite which it is desired to destroy. Often the mature worm is fairly readily destroyed if one can be assured that the drug used comes in direct contact with the parasite. When, however, one considers that the usual vermicidal agents are active poisons, and that they cannot be administered to an animal in very large doses, one can realise that the giving of such drugs, by way of the stomach, is hardly likely to have a very deadly effect upon worms in such places as the lungs, on account of the drug being so highly diluted in the blood stream. In the case of stomach worms, direct application of the drug to the parasite can, in a measure, be obtained; but even in such instances treatment must be prolonged, and in many cases, especially with young animals, even if all the worms have been killed off, the damage done to the animal's health may be so profound as to be irreparable. Furthermore, it must be remembered that if animals are kept in the paddocks where they have become infested, reinfestation will be constantly taking place, consequently a few doses of vermicidal medicine are not likely to produce the desired result.

Round Worms of the Bronchi and Lungs.

Nearly all species of live stock may be affected with worms in the respiratory passages, but the most important to stock-owners in this country are those infesting sheep and young cattle, viz., *Strongylus filaria* of sheep, *Dictyocaulus viviparus* (*Strongylus micrurus*) of calves, and *Synthetocaulus rufescens* (*Strongylus rufescens*) of lambs.

These give rise to the condition commonly known as Husk or Hoose. So far as the life history of lung worms in general is concerned, there is a good deal yet to be ascertained, but generally speaking, one may state that the egg when laid contains an embryo, which leaves the egg within a short time after the latter is deposited by the female in the lungs, &c. The embryo makes its way to the exterior by way of the trachea, or windpipe, and the nasal passages. Their power of resistance to adverse conditions is considerable. In suitable situations the embryo can live for long periods. It is held by some authorities that the embryos pass some part of their existence in the body of an intermediate host, *e.g.*, an insect, mollusc, or worm, but this at present is only hypothesis.

A calf, sheep, or lamb becomes infested by taking in embryos with the food. It is supposed that the embryos first pass into the rumen or paunch. They are brought back again into the pharynx during the act of rumination, whence they gain entrance to the air passages.

The effect the worms produce upon the respiratory tract is a bronchitis or a broncho-pneumonia, usually of a chronic nature. In the lungs the changes are often accompanied by the production of chronic inflammatory fibrous tissue. Consequently, parts of the lungs of an infested animal may be quite fibrous in consistency. Not infrequently, secondary effects are set up by the penetration of bacteria into the damaged lung tissue.

Round Worms of the Stomach and Intestines.

Losses in live stock owing to the depredations of these parasites occur every year, but during the past few years the mortality in sheep and cattle from what are commonly known as stomach worms has been considerable, and it is to this particular group that I shall confine my remarks, although there are numbers of other species of round worms inhabiting the intestinal canal of live stock.

The three worms it is proposed to discuss are:—

1. *Hæmonchus* (*Strongylus*) *contortus,* in cattle and sheep.
2. *Ostertagii circumcincta* (*Strongylus cervicornis*) in sheep and cattle.
3. *Trichostrongylus axei* (*Strongylus gracilis*), also in sheep and cattle.

The life cycle of these stomach worms is a simple one, and the following broadly represents it. The egg is laid by the female in the alimentary tract of the host animal. The embryo may develop from the egg either whilst it is in the bowel of the animal, or in the excreta after the latter has been passed out into the open.

The period the embryo takes to hatch out depends upon conditions of moisture and temperature, and may vary from a matter of hours up to weeks. The larva which then develops forms a protective sheath around itself, and lives upon the food material which is stored up in its own body. In this state in can survive adverse conditions, *e.g.,* dryness, cold, &c., for some months. With a warm temperature, however, the larva becomes active, and makes its way up the blades of grass, &c., where it again comes to rest. When such grass is eaten, the larva is swallowed with it, and in the animal's stomach develops and becomes an adult worm in about three weeks. The two sexes then copulate, and the female produces its eggs.

A thing of some practical importance becomes evident from the foregoing, viz., that there is no actual multiplication of the worms in the animal's stomach, *i.e.,* the number of adult worms present in an animal represents no more than the number of larvæ actually swallowed; and it therefore follows that the degree with which an animal may be infested with such parasites depends upon the facilities with which the larvæ may be picked up and swallowed.

The condition produced by such worms is a chronic inflammation of the true stomach, accompanied by diarrhœa, wasting and anæmia. The effects due to these worms upon the health of the animal cannot be ascribed solely to the local irritation or to the amount of blood abstracted. The profound anæmia seen in animals suffering from these parasites is due to something else besides this. It is probable that it is due to a toxin secreted by the worms acting upon the blood. It has been proved that the bodies of some intestinal worms do contain poisonous substances, which upon injection under the skin of animals have produced serious effects. However, one must be careful how one draws conclusions from such experiments. The injection of the extracts from the bodies of worms into the body of an animal is not quite the same thing as the presence of the intact worm in the intestinal canal.

Young animals suffer most severely from the effects of these stomach worms, but adult animals are not infrequently affected also.

A review of the life history of the stomach worms enables one to learn other points of practical importance, *e.g.*, (1) In wet seasons one must be prepared for an increase in the number of such parasites. (2) That moist places are always to be considered a harbour for the larvæ of the worms. (3) That if one is trying to eradicate worms from a paddock by starving them out, *i.e.*, by removing all stock to fresh dry paddocks, the infested paddock will need to remain free from sheep or cattle for a relatively lengthy period.

It appears to be the general impression that *Hæmonchus contortus*, the twisted stomach worm, is the sole or main cause of parasitic gastro-enteritis of sheep and cattle in Australia. This is an error. Although it can and does occasion considerable loss in live stock, yet the other two stomach worms, *Ostertagii circumcincta* and *Trichostrongylus axei*, are responsible for far more serious losses in young stock than *H. contortus*.

This popular error can be readily explained. *H. contortus* is exceedingly common in the true stomach of cattle and sheep, and is readily distinguishable in the stomach contents upon a post-mortem examination. On the other hand the two other worms cannot, as a rule, be detected merely by looking at the mass of stomach contents. These particular parasites are short, very slender, and whitish in colour, somewhat like very short pieces of fine cotton. They may be present in myriads in the stomach contents of an animal, and yet the usual casual inspection of the latter will fail to reveal them, although the contorted worm, if present at the same time, will be easily seen. In several instances brought to my knowledge, animals have been suspected to be suffering from parasitic gastritis, and yet the owner, on making an examination of the stomach contents, has failed to convince himself for the foregoing reasons.

If, however, in such a case a small amount of the stomach contents be placed in a shallow glass vessel, and then well diluted with water, these small parasites may be readily discerned.

Another point also to be borne in mind when sending material for diagnosis, is that the stomach worms die soon after the death of the host animal, and undergo digestion if they remain in the unopened stomach. Consequently, if such a stomach be removed and sent for examination, as a case of suspected parasitic gastritis, and if any time has elapsed since death, the individual making the examination may not be able to find any worms at all, although they may have been present in enormous numbers before death.

CLEARING LAND AND SUBSOILING WITH EXPLOSIVES.

A LIMITED number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Field Assistant, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

LIST OF PLANTS DECLARED TO BE NOXIOUS IN VARIOUS SHIRES AND MUNICIPALITIES DURING THE MONTH OF MAY, 1918.

Plant.		Municipality.	Shire.
Scientific Name.	Common Name.		
Rubus fruticosus	Blackberry	Bowral. Coraki. Rockdale. Uralla.	Eurobodalla. Sutherland.
Xanthium strumarium	Noogoora Burr	Moree.	Muswellbrook.
Marrubium vulgare	Horehound	Armidale Uralla.	Narraburra.
Rumex, sp.	Docks	Armidale. Uralla.	
Centaurea calcitrapa	Star Thistle	Coraki.	Timbrebongie.
Rosa rubiginosa	Sweet Briar	Coraki. Uralla.	Eurobodalla.
Eichhornia crassipes	Water Hyacinth	Coraki.	Eurobodalla.
Cryptostemma calendulacea	Cape Weed	Coraki.	
Xanthium spinosum	Bathurst Burr	Gulgong. Uralla.	Eurobodalla.
Carduus lanceolatus	False Scotch Thistle	Uralla.	
Datura Stramonium	False Castor Oil Plant	Uralla.	
Phytolacca octandra	Red Ink Plant	....	Eurobodalla.
Ricinus communis	Castor Oil Plant	....	Eurobodalla.
Echium plantagineum	Paterson's Curse	....	Gloucester.
Inula graveolens	Stinkwort	....	Namoi. Timbrebongie. Weddin. Goodradigbee. Wingadee.
Alternanthera achyrantha	Khaki Weed	....	Mumbulla.
Verbena bonariensis	Wild Verbena	....	Mumbulla.

PURE SEED MAIZE FOR SALE.

The Department of Agriculture has a limited amount of pure *selected* seed maize for sale for the coming season, both for grain and fodder purposes, as follows:—

Variety.	Seed available at—	Railway Station or Wharf.
Improved Yellow Dent Leaming	Grafton Experiment Farm	Grafton.
Red Hogan	Hawkesbury Agricultural College	Richmond.
Early Yellow Dent	Glen Innes Experiment Farm	Glen Innes.
Silvermine	Yanco Experiment Farm	Yanco.
Funk's Yellow Dent	North Bangaroo Stud Farm	Canowindra.

The price is 7s. 6d. per bushel f.o.r. or f.o.b. at the station or wharf mentioned. Bags, 9d. each extra.

As the supply is limited, intending purchasers are recommended to apply at once direct to the respective Experiment Farms, but inquiry should be made to ascertain whether the required quantity is in stock before remittance is sent.

All orders should be accompanied by remittance, with exchange added for cheques.

Herd-testing on the North-Coast.

OPERATIONS OF THE TWEED–RICHMOND HERD-TESTING COUNCIL, 1916-18.

L. T. MACINNES, Acting Dairy Expert.

THE Department of Agriculture has for many years past made the testing of the State's dairy herds for milk and butter-fat production a foremost part of its policy for developing the dairying industry. Previous to 1913 several attempts were unsuccessfully made in various parts of the State to induce farmers to enter their herds for testing. Each testing association was subsidised to as much as 20s. in the £, but, for various reasons which need not be here specified, all efforts to arouse continued interest on the part of the dairy farmer failed.

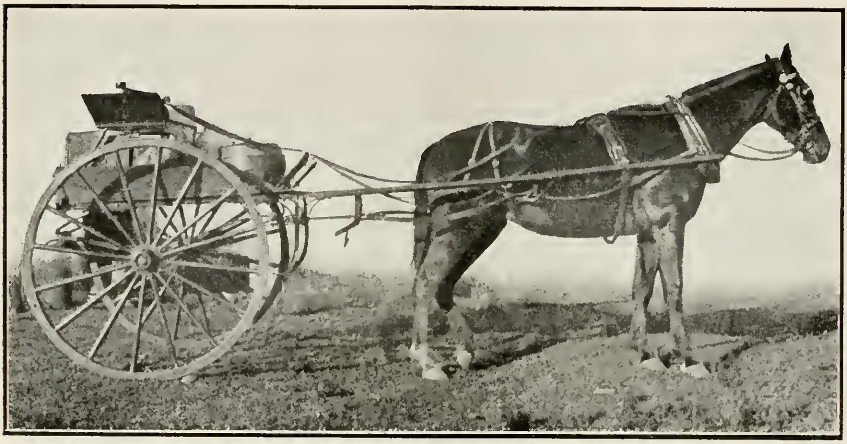
A Tester at Work—Tweed–Richmond Herd-testing Council.
With some twenty of his fellow testers he is now with the A.I.F. abroad.

Some years ago the writer was instrumental in establishing the movement in the Tweed and Richmond River districts. When the war broke out in 1914 the work of testing these North Coast herds was in full swing, as many as fifteen units, each of 1,400 to 1,600 cows, being formed up. Owing to those employed as testers leaving for the front, one association after another suspended operations, until only one, the combined Bangalow–Byron Bay unit, was left to maintain the continuity of a service which means so much for the future of our third greatest primary industry.

It was decided by the Council which governed herd-testing on the North Coast that at least this one unit should be kept going, so that after the war it might form a nucleus for reviving the movement.

Testing has now been carried out continuously for six years, and several farmers are in their seventh testing period. These continuous records are most valuable as educational factors, and should, when the time comes for action, provide conclusive arguments for persuading farmers in other centres to combine in a similar manner, until every animal used in the milking herds of the State is under continual observation, and her productiveness in milk and butter fat, with other important factors bearing on such yields, recorded. If this can be accomplished, dairying in New South Wales should enter upon a new era, one of further advancement and prosperity.

Under these circumstances the operations of the Tweed-Richmond Herd-testing Council for the years 1916-18 should be of great interest to all engaged in dairying in New South Wales and elsewhere.



A Tester's Equipment.

Ready for the next farm in the Testing Unit. One Tester looks after up to twenty-five herds, averaging sixty cows each.

At the sixth annual meeting of the Bangalow unit, held under the auspices of the Tweed-Richmond Herd-testing Council on 29th April, Mr. A. W. Hinwood, who has acted as Secretary to the Council since its inception, submitted his report for the last two years' operations, from which the following extracts are made:—

As you are aware, it was resolved by the Council to maintain only the central unit at Bangalow-Byron Bay whilst the war continued. The operations of the combined Byron Bay and Mullumbimby units were therefore discontinued on the 31st August, 1916. The Nimbin unit made an excellent start, but on the resignation of their tester, on the 30th April, 1917, the operations of that unit ceased, as it was impossible to secure the services of a suitable tester. The Bangalow unit, in which are included members of the Byron Bay unit, was maintained at full strength during the period under review, and the herds of several members have been tested for six consecutive years.

The movement is virtually stationary, owing to the abnormal conditions prevailing; but, in my humble judgment, it will be an essential factor to the future welfare of the dairy industry when conditions revert to normal. My intimate acquaintance with herd testing, not only in my official capacity, but as a dairy farmer, has convinced me of the immeasurable benefits derived by systematic testing. I am still of opinion that average herd production is far below a standard compatible with the capital and labour employed in the business. No industry should be tolerated that cannot pay a living wage, and the demands of labour, which must receive due consideration, and which are not likely to be moderated, may be more equitably met by increased production. This is possible of accomplishment by the scientific methods of herd-testing at a minimum of cost, and its organisation should receive the generous support of both the Government and dairy farmers.

The tester of the Bangalow Association, Mr. Norman Wilshire, has compiled the following information in connection with the work of the last two years. These returns give the average yields of each herd in pounds of commercial butter (calculated by the O'Callaghan chart), and it will be noted that for both years the Jersey breed gave the three highest yields. Next year I hope the average weight of the milk yields, and the number of cows tested in each herd, will be included, so that a better comparison of the productiveness of each breed can be arrived at.

HERD Averages for the Twelve months from 1st March, 1916, to 28th February, 1917.

Order of Merit.	Average per cow. lb. butter.	Class.	Order of Merit.	Average per cow. lb. butter.	Class.
1	310·9	Jersey.	14	247·9	Shorthorn.
2	307·7	,,	15	238·4	,,
3	303·2	,,	16	236·6	,, (8 Jerseys).
4	298·2	Shorthorn.	17	235·8	,,
5	295·0	Jersey	18	234·7	,,
6	286·7	Shorthorn.	19	231·9	,, (11 tests).
7	285·6	,,	20	225·6	,,
8	281·3	,,	21	220·2	,,
9	275·4	,, (11 tests).	22	213·5	,,
10	272·8	,,	23	211·0	,, (8 tests).
11	272·5	,,	24	209·2	,,
12	260·1	,,	25	201·4	,,
13	258·3	,,			
		General average		256·47	

The owners of the three leading herds were—W. J. Rankin, 1st; P. Rixon, 2nd; F. G. Flower, 3rd.

HERD Averages for the Twelve months from 1st March, 1917, to 28th February, 1918.

Order of Merit.	Average per cow. lb. butter.	Class.	Order of Merit.	Average per cow. lb. butter.	Class.
1	315·15	Jersey.	12	255·00	Illawarra and Milking Shorthorn grades.
2	292·61	,,			
3	287·99	,,	13	251·72	,, ,, (2 Jerseys).
4	284·65	Mixed grade Milking Shorthorn and Ayrshire, and a few grade Jerseys.	14	248·15	Illawarra and grade Guernseys.
			15	242·39	,, and grades.
			16	235·43	Mixed grades.
5	275·79	Shorthorns, Illawarra, and grade	17	*229·22	Milking Shorthorns and grades.
6	274·79	Illawarra and Milking Shorthorns, and grade do.	18	223·11	,, ,, ,,
			19	218·46	,, ,, ,,
7	273·20	,, ,, ,,	20	217·60	,, ,, ,, (Ayrshire).
8	263·10	,, ,, ,,			
9	262·18	,, ,, ,,	21	202·67	,, ,, and grades.
10	258·89	,, ,, ,,	†22	..	,, ,, Illawarra, and grades.
11	256·73	,, ,, ,,			
		General average		255·66	

* Incomplete. † Incomplete; 25 cows removed from herd end of first 6 months.

The owners of the three winning herds for this period were—F. G. Flower, 1st; P. Rixon, 2nd; W. J. Rankin, 3rd.

Herd Averages—*continued*.

The results may be summarised as follows:—

	Year ended 28th February.	
	1917.	1918.
Number of herds tested	25	25
Total number of cows tested	1,351	1,414
Average yield lb. butter per cow, highest herd	310·9	315·1
,, ,, ,, lowest herd	201·4	202·6
,, 100 best cows, lb. butter	398·6	387·9
,, ,, lb. milk	7,411·6	7,304·8
,, 100 worst cows, lb. butter	143·6	136·7
,, ,, lb. milk	2,871·3	2,764·4
Yield of best cow, lb. butter	631·5	788·7
,, ,, lb. milk	13,335	14,565
,, worst cow, lb. butter	91·3	48
,, ,, lb. milk	1,860	1,080
Number of cows culled during first 6 months	90	114

Tests conducted regularly once a month.
Season 1916–17, normal; 1917–18, very poor grazing during winter months, extra good grass for balance of year.
Record of culled cows not included.
Hand-fed cattle less than 1 per cent.

Summary of Herd Averages.

	Year ended 28th February.	
	1917.	1918.
Number of cows in the herds producing as under—		
Below 150 lb.	71	73
151 lb. to 200 lb.	195	171
201 lb. to 250 lb.	340	292
251 lb. to 300 lb.	303	315
301 lb. to 350 lb.	209	175
351 lb. to 400 lb.	77	86
401 lb. to 450 lb.	35	13
451 lb. to 500 lb.	3	2
501 lb. to 550 lb.	2	1
551 lb. to 600 lb.	...	1
600 lb. and upwards	1	1
Total culls during the first 6 months	90	114

In connection with the compiling of the foregoing figures I desire to point out that the records given represent the whole of each herd, less cows culled during the first few months of the year, and which had been disposed of and removed from the farm; also heifers and newly-purchased cows introduced to the herd within the last few months of the year. For comparison the herd records of previous years on a similar basis are given later.

These tables show that the average yield of all cows tested (1,351) in 1917 was practically the same as that for 1918, when 1,414 had their yields recorded. This in a measure was influenced by the difference in seasons.

In connection with the average yields of the Tweed–Richmond district, it is interesting to compare the figures recorded since the inception of testing in 1913. For the year ending 28th February, 1914, excluding the yields of those culled, the average for the whole area was 169·7 lb. butter and 3,495 lb. milk. The best herd tested gave 5,467 lb. milk, 270½ lb. butter, which is only 15 lb. more than the average for the past two years for Bangalow herds. For this year there was no testing done in the Bangalow district. During the year ending 28th February, 1915, the average of the whole area was 227½ lb. butter, that for the Bangalow unit being 241·66 lb. For the year 1917 the Bangalow figures were 256·47 lb., and for 1918 255·66 lb. butter.

The following table, which has been compiled from records available, compares the percentage of cows that have given butter yields of the various dimensions stated for the years 1914, 1915, 1917, and 1918. These are herds which completed a full twelve months' testing:—

Year ending 28th February.	No. Tested.	Average Yields of Butter in lb.				
		Below 150.	151–200.	201–250.	251–300.	301 upwards.
		per cent.	per cent.	per cent.	per cent.	per cent.
1914	5,193	32·5	51·5	14·0	2·0	......
1915	13,898	1·6	20·0	45·6	28·0	4·8
1916	No record available.					
1917	1,236	5·7	15·8	27·5	24·6	26·4
1918	1,130	6·4	15·1	25·9	27·9	24·7

Taking 250 lb. butter standard as a dividing line, in—

1914 there were 2 per cent. above and 98 per cent. below 250 lb.
1915 „ „ 32·8 „ „ 67·2 „ „ „
1917 „ „ 51·0 „ „ 49·0 „ „ „
1918 „ „ 52·6 „ „ 47·4 „ „ „

Taking the Bangalow Association alone, the corresponding figures are:—

Year ending 28th February.	Average Yields of Butter in lb.				
	Below 150.	151–200.	201–250.	251–300.	301 upwards.
	per cent.	per cent.	per cent.	per cent.	per cent.
1915	.. ...	3·9	57·6	34·6	3·9
1917	5·7	15·8	27·5	24·6	24·4
1918	6·4	15·1	25·9	27·9	24·7

It is seen that in

1915 there were 38·5 per cent. above 250 lb. and 61·5 per cent. below.
1917 „ 51·0 „ „ „ „ 49·0 „ „
1918 „ 52·6 „ „ „ „ 47·4 „ „

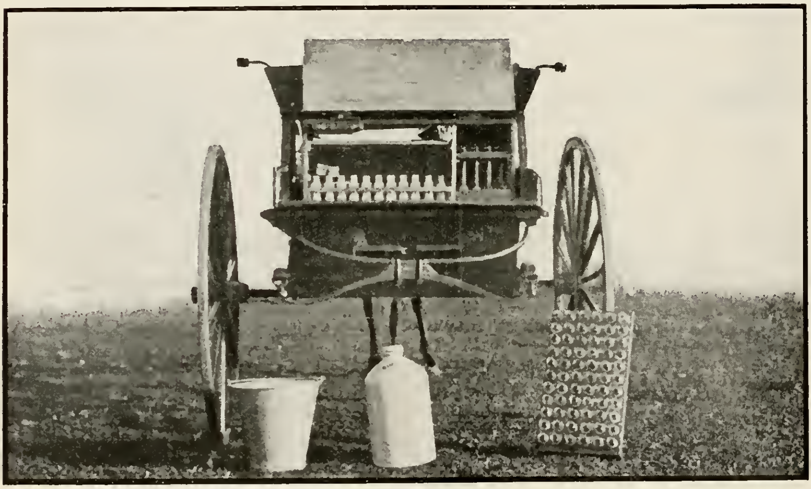
This shows that the benefits anticipated from systematic herd-testing are being realised. In four years to increase the percentage of cows yielding an average of over 250 lb. butter from 38·5 to 52·6 is very satisfactory, and should encourage dairy farmers to go on persevering. In a rich dairying district like the Big Scrub, there should not be one herd yielding below 250 lb. butter per cow.

Two things are to be faced by the dairying industry after the war:—

(*a*) Margarine competition, with its tendency to lower prices.

(*b*) Higher cost of production.

Now, the industry as it was developed and carried on before the war could not be said to have been a payable business proposition, taking it on the average. A yield of 170 lb. of butter per cow a year (the average on the North Coast just before war broke out) is not sufficient by a great deal, and with that low return the farmer was content to receive an equally low price. The average price to the producer was considered good if it reached 10d. per lb. The only way by which dairying could be carried on under such conditions was by what is called the "family" system, *i.e.*, the aggregate earnings of the whole family (four to six persons) were retained in the hands of one—the father, or whoever was the head If the owner of the farm had no family of his own available, he engaged someone who had, and worked his place on the shares. At the present time the value of dairy produce is giving the farmer 1s. 2d. to 1s. 3d. per lb. for his butter; the seasons have been good and prices for calves and pigs high. But are these prosperous conditions going to continue when bad seasons return, as they will? If prices recede to a lower level, as is likely through the enormous increase in margarine production (in England the present output is 4,000 tons per week more than before



A Tester's Equipment.

Showing how the apparatus is fitted into the sulky.

the war) what will the future of dairying be? The position is a most serious one, but that is all the more reason why it should be faced resolutely, and now is the time to take the steps that are necessary to save an industry that means so much for the future of the country.

There are two ways by which the problem can be solved :—

(a) To manufacture and market dairy produce of the best quality—nothing under choicest grade.

(b) To double the average yield of milk and butter from each cow.

The financial salvation of the dairy farmer hinges on getting a greatly increased return per acre, and in dairying districts that means an increased yield from each cow.

Last year, from the records given, each cow in the Bangalow Testing Association yielded a butter return to the farmer valued at £15, but this is greatly above the State average. If a cow's return in butter amounts to £10 per annum, it should not be considered excessive in normal times. At pre-war prices, the average yield for the State would have to be 240 lb. butter per cow in order to do this, whereas in 1914 it only amounted to 170 lb.

There are several ways of increasing the herd yields, by careful breeding and culling, and by plentiful and judicious feeding. It is now recognised in all dairying countries that herd-testing for production is the surest and shortest method of building up the herd Use a pure-bred prepotent bull of undoubted production strain. Before buying an animal to put at the head of the herd, make sure, if he is young, of the production of his dam and his sire's dam, also of his sisters. If he is aged, it is most desirable to know the production of some of his daughters. There are a good many dairy sires in New South Wales that require culling out when judged on these practical lines, in spite of their handsome appearance, and more or less long pedigree. When cows have been tested, breed only from the best producers—cull out those that do not come up to standard. Only in this way can the herd average be built up in a few years, and speed is urgent.

It is pleasing to note by the last two years' returns from Bangalow, that during the first six months of each period ninety cows, or 6·7 per cent., were culled out in 1917, and 114, or 9·1 per cent., in 1918. The number would probably have been higher if it had not been for the plentiful supply of feed in the pastures; the percentage disposed of usually is about 10 per cent. per annum. This heavy culling out of the non-paying milker, and breeding from the best producers, is responsible for the number of cows yielding over 250 lb. a year.

The example that is being shown to the whole of New South Wales by those North Coast dairymen who are keeping the testing movement going, must have a marked effect on the future of dairying when the war is over, and testing once more is taken up as it was in 1914. The Bangalow Association has now commenced another year's work with a full unit—some 1,500 cows—and, as usual, there were more applicants than there were vacancies. War conditions alone prevent putting on more testers. The body behind this movement, that is doing such educational work so quietly, is the Tweed–Richmond Herd-testing Council, which receives an annual subsidy of £20 from the Department of Agriculture for every unit that completes a full twelve months' testing.

The Tweed–Richmond Herd-testing Council.

This Council was organised to give uniformity in all matters connected with herd-testing in those districts coming within the scope of the various associations already formed, and to be formed, up in the Tweed–Brunswick–Richmond River watersheds. The inaugural deliberations were held in Murwillumbah on 3rd March, 1913.

This Council should fill a large and important place in the Australian dairying world. To its care has been entrusted a movement that, properly guided and supported, ought to be capable of doing more to uplift the dairy farm industry than anything else that appears on the dairying horizon at the present moment. Comprising the pick of the farmers of the foremost dairying district in the State, the Tweed–Richmond Herd-testing Council is expected to accomplish much to benefit dairying. From such a body of men only good can be expected to come. Their wide and practical experience in breeding dairy stock, backed up as it is now with scientific testing records, should soon effect a beneficial change in the quality of the milking herds. This movement, above all others, stands for the advancement of the dairying industry; and after the war it is expected that by the Council's aid and the existing machinery at their disposal herd-testing will be reorganised on a far larger scale than before. It is hoped that the work will spread to include all dairy herds in the State.

ANOTHER NEW WEED FOR NEW SOUTH WALES (*Richardsonia scabra*).

Mr. N. JOUBERT, of Terranora, Tweed River, has forwarded to the Government Botanist a sample of a weed which was new to him. It has now been identified as *Richardsonia scabra*, Mexican clover, and this is the first record of the plant in New South Wales territory.

Mr. Maiden reports that there is a considerable difference of opinion in the United States as to the fodder value of this plant. The following is extracted from an article in a bulletin issued by the United States Department of Agriculture:—

> According to some it is a valuable pasture plant, while others affirm that neither cattle nor horses will eat it. On rich lands it can be cut, making a nutritious and palatable hay, which is readily eaten by all kinds of stock. Chemical analysis shows that the hay contains as much nutriment as red clover. It is never cultivated, but it appears as a weed after corn and cotton have been laid by. In Florida it is considered an excellent plant to grow in orange groves as a mulch, and to turn under for green manure.

Bailey, in his *Weeds and Poison Plants of Queensland*, says of it:—

> This weed has been troublesome in the tropical gardens for some years past, and during the past summer has spread considerably in the fields about Brisbane.

Mr. Maiden's opinion is that it is a weed pure and simple, so far as we are concerned, and it is difficult to get rid of, but it is not without pastoral value.

Official Milk and Butter Records.

L. T. MacINNES, Acting Dairy Expert.

The following milk and butter records of pure-bred cattle, whose yields have been computed under the testing scheme of the United Pure-bred Dairy Cattle Breeders' Association of New South Wales, by officials of the Department, are now available for publication.

Mr. E. P. Perry's Guernsey Herd, "Nundorah," Parkville.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.			Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Butter Fat.	Milk.		Butter.	Milk.	
	yrs.	1917.	lb.	lb.	lb.	%	lb.	lb.	
Golden Hope (imp.), 70.	3	20 April..	376	320	6,862	4·6	1·12	18	273
Mignonette VII (imp.), 114	7	17 ,, ...	416	354	6,490	5·4	1·11	17½	,,
Eugene of Nundorah, 46	3	19 ,, ...	266	226	4,611	4·9	·75	12	,,
Sheila of Nundorah, vol. ii	2	15 June...	253	215	3,994	5·4	·83	12	,,
Nancy of Nundorah, vol. ii	2	5 July...	356	303	5,677	5·3	1·10	14½	,,
Buttercup of Nundorah, vol. ii	2	10 ,, ...	307	261	6,174	4·2	·94	16½	,,
Brunette of the Isle, (imp.), 21	3	7 Sept..	260	221	4,689	4·7	·85	13½	,,

In addition to pasture the cows received the following feed daily :—May, 1917, 6 lb. bran, 2 lb. boiled corn ; June and July, 4 lb. molasses, 7 lb. bran ; August, 6 lb. bran, 4 lb. molasses ; September and October, 6 lb. bran ; November and December, 6 lb. bran, 4 lb. molasses ; January, 1918, 2 lb. molasses, 6 lb. bran ; February and March, 6 lb. bran, and 4 lb. molasses ; April, lucerne hay.

Mr. C. R. G. Macdonald's Jersey Herd, "Gordon," Ingleburn.

Name of Cow and Herd Book No.	Age at beginning of Test.		Date of last Calving.	Total.			Average Test.	Yield on last day of Test.		No. of days on Test.
				Butter.	Butter Fat.	Milk.		Butter.	Milk.	
	y.	m.	1917.	lb.	lb.	lb.	%	lb.	lb.	
Brighton Lady II, vol. vi	1	11	3 July...	300	255	4,986	5·1	·95	14	273
Brighton Queen of St. Lambert II, vol. vi ..	2	0	25 Aug....	424	361	7,534	4·8	1·27	22	,,
Brighton Coomassie III, vol. vi	1	10	2 Sept....	385	327	5,869	5·6	1·16	15½	,,

In addition to pasture, each cow received daily :—2 lb. each of bran, pollard, linseed oil meal, and maize meal, and 4 lb. lucerne chaff.

The Scottish Australian Investment Co.'s Milking Shorthorn Herd at Darbalara.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.			Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Butter Fat.	Milk.		Butter.	Milk.	
	yrs.	1917.	lb.	lb.	lb.	%	lb.	lb.	
Minnie XI, vol. iv ...	3	13 Feb. ..	426	363	7,239	5·0	·76	14	365
Champion XII, vol. iv	2	17 ,, ..	321	273	6,678	4·1	1·04	19½	334
Camellia XIII, vol. iv	3	21 April...	421	358	8,657	4·1	1·06	22	365
Champion III, 839 ...	13	27 May ...	410	349	7,855	4·4	·75	14	273
Melba X, vol. iv ...	2	21 ,, ...	408	347	8,413	4·3	1·13	19½	,,
Melba IV, 1576 ...	11	8 Aug....	582	495	11,763	4·2	1·86	32	,,
Champion XIV ...	1¾	3 ,, ...	365	310	7,866	3·9	1·12	23½	,,
Rapture II, vol. iv ..	6	1 Sept...	564	480	11,062	4·3	1·55	26	,,

The whole of the cows were fed on natural pasture only, with the exception of Melba X, Melba IV, and Champion XIV, who, in addition, were fed daily as follows:—

Melba X received in June, July, August—5 lb. bran, 8 lb. oaten chaff, and 4 lb. boiled maize.

Champion XIV received in August the same as Melba X, and in April, 1918, 4 lb. oaten chaff, 4 lb. bran, 2 lb. crushed oats.

Melba IV received in August 3 lb. pollard, 8 lb. oaten chaff, 4 lb. crushed oats, 2 lb. oilcake; in September 2 lb. pollard, 5 lb. oaten chaff, 3 lb. bran, 3 lb. crushed oats, 1½ lb. oilcake; in April, 1918, 4 lb. oaten chaff, 4 lb. bran, 2 lb. crushed oats.

Mr. S. Hordern's Jersey Herd at "Retford Park," Bowral.

Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total.			Average Test.	Yield on last day of Test.		No. of days on Test.
			Butter.	Butter Fat	Milk.		Butter.	Milk.	
	yrs.	1917.	lb.	lb.	lb.	%	lb.	lb.	
Retford Deer, 4146 ..	3	24 May ...	499	425	7,615	5·5	1·89	26	273
New Year's Beauty (imp.), 2419 ...	7	14 ,, ...	472	401	9,003	4·4	1·93	31½	,,
Retford Lady Viola, vol. vi	2	1 July...	380	323	6,096	5·3	1·24	17	,,
Leda's Picture, 2201 ...	7	26 ,, ...	429	365	6,030	6·0	1·09	13	,,
Nuriel's Oxford Daisy (imp.), 3050 ...	7	19 Aug....	455	388	7,362	5·2	1·14	16	,,

In addition to pasture feed, each cow received daily:—June, 1917, 6 lb. bran, 6 lb. oaten chaff; July, 6 lb. bran, 6 lb. oaten chaff, 2 lb. maize meal; August, 8 lb. bran, 8 lb. lucerne chaff; September, 10 lb. mixed chaff (lucerne and oaten), 6 lb. bran; October, 8 lb. bran, 8 lb. lucerne chaff; November, 6 lb. bran, 6 lb. oaten chaff; December, pasture only; January, February, and March, 1918, 6 lb. bran, 6 lb. oaten chaff.

Poultry Notes.

JULY.

JAMES HADLINGTON, Poultry Expert.

INCUBATION was dealt with in last month's notes; it is now proposed to follow this with points on rearing.

We are now entering upon the rearing season, the success of which will determine to a very large extent the next year's success or failure. The rearing of the young, more than any other factor, vitally affects the ultimate results obtained in poultry-keeping, not alone in regard to the number of chickens reared, but in respect of the class of development obtained. Without good development the stock will be less profitable in proportion. It is not sufficient to have so many chickens hatched, and merely kept alive; they must be reared under conditions that will ensure progressive development through all the stages from the shell to maturity. Any checks sustained in growth means something lost that can never entirely be regained.

It is an encouraging sign that whereas a few years ago the poultry-keeper was disposed to attempt to rear hundreds of chickens by more or less improvised methods that often caused as much loss in one year that would have covered the cost of good equipment, he has now been brought to see that his rearing plant is the most important part of the farm, and is disposed to instal better equipment, if means can be found to do so.

Brooding Equipment.

The poultry-farmer who looks well ahead of his requirements will now be making provision for the maximum number of chickens to be raised this season; only by so doing can he expect to escape loss, not to mention much worry and disappointment.

Those who contemplate installing, or have already installed, the hot-water circulating system of brooding, will do well to obtain Miscellaneous Publication No. 2,014 on this subject, just published, and available from this Department, as it will be found a reliable guide to the work of handling these installations, pointing out the common mistakes that have been made in many that have previously been put in.

Points in Brooding.

Whatever class of brooder is installed, there are a few main principles applicable to most, if not all, of them.

The first essential to successful brooding is ability to generate sufficient warmth so that it will not be necessary to shut the chickens in to obtain it, at any rate after the first couple of days, because after that time the chickens should be free to go in and out of the heated portion of the brooder. Here again, if it is not possible to obtain sufficient heat, as is the case with many brooders in use, it means that the brooders have to be closed up too much to enable them to generate sufficient heat, therefore they are badly ventilated. It should be remembered that good development is not possible without plenty of fresh air, and that a few holes bored in a brooder, with a small aperture for egress and ingress, is not, as is often imagined by the novice poultry-keeper, sufficient ventilation. The more air that can be admitted, consistent with the retention of sufficient warmth, the better.

Another point in regard to the heat in brooders is that although the way in which the chickens will spread out or crowd together is a good indication of the temperature of the brooder compartment, it is a dangerous practice to rely wholly upon it. It is a much safer plan to hang in each compartment a thermometer, the bulb of which should hang about 2 inches from the floor of the brooder.

While on this subject it may be mentioned that many poultry-farmers with hot-water installations are not using thermometers in the different brooder units, but are taking their temperatures from a thermometer attached to the intersection of the hot pipe where it enters the brooder system. This, I might point out, is likely to be very deceptive and inefficient as a guide to the temperatures of the different units, and I fear that this practice has caused a great loss of chickens in these systems. The idea of saving labour and attention in chicken-rearing can be carried too far.

The Housing of Brooders.

It is possible to have an ideal system of brooding, but the houses in which they are installed may nullify the otherwise good prospects of success. For instance, no matter what class of brooder is put in an open-fronted brooder house it is very likely to result in more or less defective working of the brooder installation, because this class of house is subject to wide variations of temperature, and it only requires a change of wind to cause most of the heat to be driven from the brooder units. This may take place any night, with the inevitable consequence of crowding the chickens. Nine-tenths of the troubles encountered in rearing chickens occur through crowding; and all the while the operator may be quite oblivious of the fact that any crowding has taken place, and when the chickens are seen to be droopy and pining away, disease is usually suspected instead of the true cause.

In regard to the size of the brooder units, in a sectional brooder 100 capacity of baby or day-old chickens is the most convenient and safe, if properly worked. These units are better oblong than square in shape, and a 4 x 2 feet floor space, with a height of 14 to 16 inches, is about right; but it should be understood that no matter what the denomination of the brooder may be, the total rearing capacity should not be based upon that of day-old chickens. For instance, a brooder accommodating 100 day-old chickens will only be safe for that number up to at most ten days. The chickens should then be thinned down about every ten days—first to seventy-five, then to fifty or even forty, as the chickens develop in size. If this is not done they are very likely to commence thinning themselves; in other words, to start dying off.

Temperatures.

The temperatures at which it is desired to keep brooders at different stages is often mis-stated. I have always obtained the best results by adopting the following range of temperatures: 90 to 95 degrees Fahr. for the first few days, then dropping gradually at about the rate of 4 degrees per week. As the temperature is dropped it will, of course, allow of a progressive volume of fresh air being admitted to the chickens as they increase in age and size.

It is a bad practice to allow the heater to go out during the daytime, because should a cold change come up before the heat can be raised properly and permeate the brooders, damage might occur to the chickens, because when there is no heat they will crowd in their attempts to get warm.

Defects in Construction.

Another important matter is the position of the brooder units in relation to the floor outside. The floor of the brooder is best when on a level with the brooder-house floor; any ledge or drop from a brooder to the floor is calculated to cause trouble, notwithstanding that the chickens can get in and out easily. The trouble occurs not in the daytime, but at night, and is this: that if the brooder becomes so heated as to force the chickens outside the brooder—which is often the case during warm evenings—the chickens, when the outside temperature recedes, will be impeded in their attempts to regain the brooder, because in the dark chickens rarely get up and walk, but shuffle back by a body movement; hence the inadvisability of having any ledge at the entrance. The best arrangement in regard to egress and ingress is to have the whole length of the front of the brooder open, with an aperture of about 4 inches high by the length of the brooder, and a curtain of slitted felt hung before it to conserve the heat, at the same time allowing the chickens to come to it and breathe fresh air, while their bodies are still warm in the brooder, imitating as nearly as possible the conditions that would be present in natural brooding with hens.

A defect seen in the construction of many brooder houses is that the inside runs are far too small to accommodate the number of chicks that the brooder units are designed to hold. The result is that in bad weather, when it is desirable to keep the chickens inside, these small inside runs are so congested with the number of chickens that they become unhealthy and insanitary. A 100-capacity brooder should have an inside run to it containing about 36 square feet of floor-space.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Braidwood.

A meeting was held on 30th May, when an interesting paper was read by Mr. A. Page, the subject being "Soils and Soil-fertility."

Clovass.

A meeting of this branch was held on 22nd May, when only general business was transacted.

Coobang.

A meeting of this branch was held on 10th May, when Mr. W. T. Annison read a paper on pruning, which provoked a useful discussion on the subject.

PRUNING.

The object of pruning is to shape the tree and regulate the amount of bearing wood each season. I consider the pruning at the time of planting is the most important, for not only does it have an effect on the future shape of the tree, but the subsequent vigour depends upon it. I believe in cutting hard back for the first three years, but no hard-and-fast rule can be laid down, as trees vary in size and shape when received from the nursery, and the rainfall also is an important factor. Should the tree, when received, have one straight stem, cut it back to about 18 inches from the ground. If it is a year older and has a head, cut out all except three or four branches, and cut them well back, making the cut half an inch above a bud facing the direction a branch is required. Cut to an outer bud to spread the tree, and to an inner one to cause it grow more upright. I prefer the V shape, starting the branches low and keeping the tree as low as possible without spreading too much. This allows the cultivator or plough to get close, saving hand-hoeing, and the tree being low enables spraying to be done more effectively. The amount of wood to be taken off the second year depends on the growth made; a vigorous tree can have more wood left on than one that has not made much new wood. The latter should be cut well back.

Some varieties, such as Japanese plums, will blossom the first year, but no fruit should be allowed to remain on the trees in the first year, and only a few on extra vigorous trees in the second year. I leave some fruit on strong trees, as this tends to keep back excessive wood growth.

In pruning young trees I leave the wood required to shape the tree, and later pull off the fruit buds rather than try to cut out all bearing wood. After the trees commence to bear, the pruning consists of thinning out and shortening back and removing dead or decaying branches. Each tree should be treated on its merits, leaving enough wood to carry an average crop of fruit, and leaf enough to shelter it from the hot sun, without making the tree so dense as to cause a weak, immature wood in the centre. Every endeavour should be made to secure strong, stout branches, evenly supplied with fruiting spurs.

The best time to prune is midwinter, and I would advise gathering the prunings as soon after as possible, for if rain falls or weeds grow it is difficult to pick them up. Pruning, combined with careful thinning of the fruit, will ensure an average crop of good quality fruit each season, while if left to themselves the trees will bear a large number of poor quality fruit one year and wood growth the next, and will soon die out.

Lidcombe.

A meeting of this branch was held on 20th May, when an interesting lecture was given by Mr. Darnell-Smith on plant diseases. It proved to be one of the most interesting and instructive lectures of the year.

Lisarow.

The first meeting of this branch took place on 25th May; the business was the election of officers. A general discussion as to the working of the Bureau also took place.

Middle Dural.

A meeting of members was held on 27th May, when a discussion took place with reference to citrus canker and woolly aphis.

Miranda.

At the May meeting of this branch Mr. R. M. Russell read a paper on clearing land, of which a summary follows:—

CLEARING LAND.

"Brushing" or cutting out the smaller growth so that grubbing and burning might not be impeded was usually the first operation. The experienced settler knew that clearing must be done thoroughly and systematically, for a stump or root that had been neglected had often caused the ruin of a plough or a nasty shaking or worse to the ploughman. As the roots had to come out sooner or later, it was better to get them all out at once. With a strong bullock team to do the first ploughing, some small roots could be overlooked, as there was less danger with bullocks than with horses. It was much easier to take out stumps when the tree was standing than after, for any mechanical device for pulling stumps afforded greater advantage if attached some distance up the tree, but too often it was desired to get the tree down, and the stump was left for someone else. Grubbing was a very heavy and expensive part of clearing, but machinery was now being developed for the work, and the usefulness of explosives was also becoming appreciated.

When starting to remove a stump, it was a mistake to be afraid of making too big a hole. The surface soil should be removed all round and thrown well back to leave room between it and the edge of the hole for the subsoil. Any roots exposed should be chopped off, but not too close to the stump, as use might be made of them with a lever or stump-jack to lift out the stump. After the stump is out, the roots should be "run" down to at least 12 inches deep.

Stump pullers were a useful part of the clearing outfit, and were adapted to a large proportion of the work. Several kinds were adapted to multiplying hand-power, the simplest being the common screw-jack or stump-jack. This implement had a hook near the ground that could be used to lift out a root, or with a spear attachment it could be leaned up against a tree and made to push the tree over by putting a hitch in the tree and fitting the spear into it. A strong tripod, with a powerful screw hung from it and worked by a lever, was another form of stump puller. Another method of getting stumps out was to attach the big end of a long, strong pole to the stump, and the small end to the team. The stump was literally twisted out of the ground. A stump hook or root-plough was also useful for small stumps when attached by a wire rope to stump pullers, especially to horse-power ones. There were several patent devices for stump or tree pulling, the principle being to anchor the stump-puller to one or more stumps by means of a chain or rope, and then to pass a chain through the puller and secure it to the stump to be pulled out. Skill was required to attach the chain to best advantage. One method with stumps was to attach the chain to a root on the far side from the puller, and pass it over the stump and attach it to a wire rope that passed through the puller. The effect was to exert the power on only a portion of the stump at one time, and to give a lifting pull. Another method of getting a lifting pull was to procure a very strong forked post, fit the butt end into a hole in a short log for a sill, and pass the wire rope or chain over the fork and attach it to the stump or root. A trestle was sometimes used instead of the fork, and some very good work could be done in running roots in this way. A useful stump puller or forest devil could be made by putting two pieces of hardwood alongside one another, securing them, say, 2 inches apart, and boring double rows of 1-inch holes in the hardwood; a hole was bored in one end to receive an anchor rope or chain with which to anchor the puller; a lever strengthened with iron, and having a chain attached, and two strong iron pins for putting in the holes as the lever was worked, was all that was necessary to complete the implement.

To place a large log close to the butt of a tree that was to be felled was a good way of ensuring that the roots would be well drawn out of the ground. On large areas steam engines or oil tractors could be used with advantage, and in all cases the loose earth lifted by the stump must be cleared away, as it was wanted to fill the hole.

Burning was a convenient way of removing logs, brush and stumps. If a stump was very dry and of good burning wood, the fire could be started by boring a hole from the top of the stump downwards and outwards, and pouring in some kerosene and applying a light. The draught through the hole would produce a quick fire. To burn a stump out properly, it was a good plan, after it was well alight, to heap plenty of wood round it, and then cover it in with sods and earth, and allow it to smoulder until it was burned away.

"Yankee grubbing" was regarded as very unsatisfactory, its only recommendation being its cheapness. In dry districts it was particularly unsuitable, because the stumps and roots took so long to decay, and often the roots suckered and became very troublesome.

Explosives were daily proving their usefulness, for with labour scarce and costly farmers were compelled to look round for something that would do their work cheaply and expeditiously. It was here that dynamite was useful for loosening difficult stumps and trees and reducing them to a more suitable condition for burning. Dynamite was obtainable now in convenient plug-form, and of a strength of 50 per cent. nitro-glycerine. The plug-form made it easy to handle and place just where the operator desired, either in or amongst the roots, or in the bodies or trunks of trees or in stumps, in any desired quantity. To do this the operator would require some knowledge of the rooting system; and as no two trees were likely to be similar in this respect, a ¼-inch steel rod was used to probe in and around the root system, before boring the holes which carried the explosive charges.

There were two methods of discharging the explosives—electricity and the ordinary safety fuse. Electric firing was done with specially-made electric detonators, for which an electric firing battery was needed. The safety fuse method was less costly, the fuse carrying the powder being cut straight across and inserted in the cap or detonator and right up against the charge of fulminate of mercury; the cap was then crimped with proper crimping pliers so as to keep them together, and this was inserted in the plug of dynamite, the paper wrapper of which was unfolded at the end and tied with a piece of string, round the fuse, to keep all together. The charge being placed under the tree or stump, the plug and cap was always put in last, and on top, and gently pressed home, after which dry earth was put in, pressed firm, and tamped solid.

Apart from land clearing, dynamite could be used for subsoiling, provided the ground was dry and hard, for breaking up boulders, digging ditches, planting trees, deepening and sinking wells, draining swamps, rejuvenating orchards, making cellars, exterminating rabbits and other minor purposes.

The lecturer dealt with the question of the care required in handling dynamite in transit, and the necessity of *slowly* thawing it when frozen hard. Attention was also drawn to the extremely sensitive nature of the fulminate of mercury in the detonator.

DEPARTMENTAL NOTE.—On account of the solubility of dynamite in water, the Department recommends gelignite for farmers' purposes; it is quite insoluble.

Moss Vale.

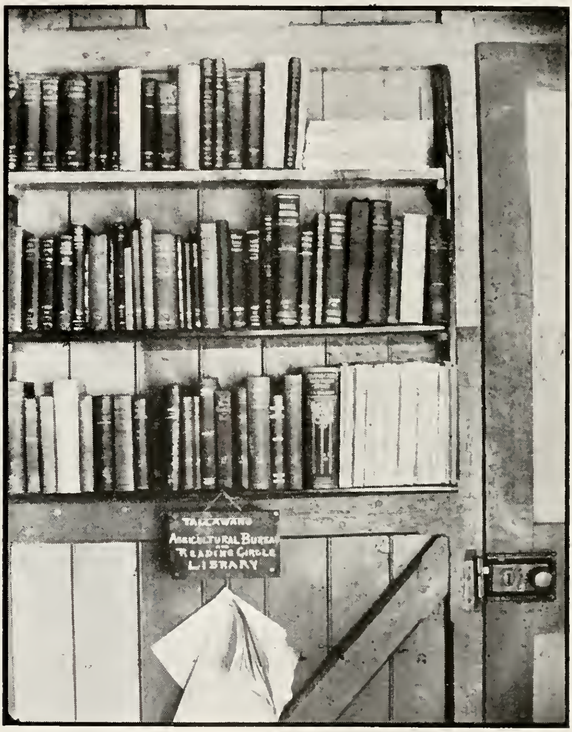
A well attended meeting was held on 31st May, when Mr. A. E. Hamilton, Stock Inspector, gave an interesting lecture on the common ailments of farm stock.

St. John's Park.

A meeting of members was held on 17th May, when an interesting lecture was given by Mr. J. C. Scott on mating, incubators, and brooding.

Tallawang.

Reference has been made to the loan of books from the Country Reference Section of the Public Library to branches of the Agricultural Bureau. The following illustration (loaned by the *Education Gazette*) will show what is being done by one branch. The co-operation between the Public School and the Agricultural Bureau has materially assisted in the success of the movement.



Hinder, photo.

Library Shelves—Agricultural Bureau, Tallawang Branch, and Tallawang Reading Circle

The Principal Librarian, *Tallawang*
Public Library of New South Wales.
Sir,

I enclose herewith a photo. of the library shelves here. Tallawang is 222 miles from Sydney and 16 miles from the nearest town—Gulgong. I have thirty regular readers coming from a radius of 12 miles.

The Agricultural Bureau has had two boxes. and the members now anxiously await the third ; and the Reading Circle—embracing farmers' wives and daughters—has had one box, and is returning it this week and applying for another. The books are housed in the local school, of which I am teacher ; and I make it a practice of making myself familiar with the scientific works—that is, their suitability to the varying type of readers among the farmers. The scheme generally is a magnificent success.—Yours faithfully, Selwyn E. Hinder.

Tingha.

At the last meeting of this branch Mr. W. Vickery read a paper, from which the following paragraphs are taken:—

Tomato Culture.

The first thing needing attention in connection with the growth of tomatoes is drainage. Many of the sandy soils have stiff clay subsoils that are extremely retentive, and that in wet seasons cause the plants to have such shallow roots that in a dry spell they suffer from heat and lack of moisture. Open drains are not as suitable as underground ones; the best from the standpoint of cheapness and quickness being made of three stringybark saplings laid at the bottom of the trench in the form of a triangle, with bushes over the top to prevent the earth falling in. The joints should be broken so that the soil will not work down and clog the drain. The depth must be sufficient to allow for cultivation, and must depend on the nature of the soil. Very stiff ground would materially benefit by the use of explosives to loosen the subsoil.

The present time is suitable for working up the ground and sowing a grain crop, such as wheat, rye, or barley, which should, if possible, be given a surface dressing of stable manure. When about a foot high, the crop should be carefully turned under, the best system for the home garden being to trench so that no portion of the crop should appear when the work is completed. This turning under should be done not later than a month or six weeks before the time for transplanting the tomatoes, in order to give the greenstuff a chance to rot. If the soil is naturally rich, it should be roughly dug for the winter frosts to mellow it.

In sowing seed, it is essential to procure varieties which have proved suitable to the district. From many years' experience I prefer Chalk's Early Jewel for an early tomato, and Vickery's Improved for mid-season and late. Earliana is disappointing for this district, as after the first few fruits the remainder of the crop runs small, and the vine is soon exhausted. Ponderosa is a good seller, but very delicate and extremely sensitive to changes in the weather, a late frost, or sudden cold snap, often proving disastrous. Vickery's Improved has been bred to get a good all-round sort—hardy, prolific, solid, and of fine flavour. It is the result of crossing Early Rue or Golden Queen on Anderson's Market Favourite. An attempt to gain earliness by crossing in Chalk's Early Jewel was unsuccessful, the tomatoes losing in flavour and meatiness.

The best time to sow seed is during August. The warmest corner of the garden should be chosen, and suitable precautions taken against frost and cold winds. When transplanting, lift the seedlings out carefully, as rough handling results in stripping off the fine roots, thus giving the plants a severe set-back. The best time to transplant is before the first flower buds form.

For early varieties 3 feet apart, and for the larger 4 feet apart, and rows 7 feet apart, are the best distances. Trellising is unsuitable, both sunburn and black spot being more prevalent on trellised tomatoes. The system of double staking, with stringybark ties, is most suitable, the plants having support on all sides, and a few nails driven into the stakes at various heights enabling one to add fresh ties as the plants grow. The stakes should be from 4 feet to 5 feet in height. The solid fleshy tomatoes are much more liable to sunburn than the soft seedy kinds.

When the plants are about 1 foot high, the best plan is to hill up on both sides, not going deeper than 2½ inches in order to avoid injury to the roots. The scarifier or cultivator should be kept going in order to keep down weeds and conserve moisture. If this results in levelling the ground, it should be hilled afresh. As soon as possible after rain the ground should be cultivated.

Discussion.—A general discussion ensued. One plan that was advocated for raising plants for a home garden was to burn large jam or treacle tins, remove the bottoms and cut down the sides, and then tie the tins round with string. In each tin plant three seeds and allow the healthiest to grow, pulling out the others. The tins were then placed in a large box containing moist fresh manure which, in decaying, generated heat to keep the tins warm. When transplanting, the seedlings received no check as the roots were not interfered with, and the tin could be easily removed.

For growing seedlings on a large scale Mr. Vickery advocated a hot-bed, warmed by means of a brick flue running underneath, a large carbide tin making a suitable furnace. The seedlings could be hardened off by gradually reducing the heat.

Wellington.

A meeting of members was held on 16th May, the business being the election of officers, &c.

It was decided that the annual subscription should be 2s. 6d. per member, and that the meetings be held at 8 p.m. on the second Friday in each month.

Windsor.

A general meeting of this branch was held on 24th May. The principal business was a lecture by Mr. H. Wenholz, B.Sc. (Agr.), Inspector of Agriculture.

Selecting Seed Maize.

Mr. Wenholz emphasised the importance of securing weight in the ears. All other points paled into insignificance when compared with that. The furrows between the grains should not be too open nor too close, and the ear should be well covered with the husk, and should droop over from the stalk when matured. Ears standing erect on the stalks, and improperly covered, were not considered suitable for selection. The importance usually attached to well-filled tips was very much overestimated, as it was usually an accident of imperfect fertilisation that caused improper filling of the tips, the result of the crop not flowering uniformly. The core of the ear should not be too small nor too large, the former being of poor carrying capacity, and the other extreme often causing the evaporation of the moisture from the interior to be prevented, a mould being set up which affected the germ of the seed, and was very hard at times to detect. The grain should not be long and pinched. Where crops of 40 bushels or more per acre were expected a small core was not desirable, but where 30 bushels to the acre or less were expected it might perhaps be justified. Wedge-shaped cobs were not desirable, owing to the variation in the size of the grain causing irregular planting by the dropper. It was not of the greatest importance to select ears with the rows of grain straight on the ear, but it was preferable. The selection of long deep grains had brought about long thin starchy grains of low-feeding value. Thick grain produced weight, and was more readily sought after by millers, because there was less bran. It was desirable that the ears selected should be of uniform size. The purer the type and uniformity the better the yield. The maturity of the crop was more even, and less waste was occasioned when the crop ripened evenly. The fertilisation of the crop was effected more easily when the crop flowered uniformly, because the pollen from the male flower (the tassel) had a better chance of becoming intermixed with the cells of the silks of the ear. The pollen from the tassel travelled in the wind up to half a mile. Imperfect fertilisation was brought about by the neighbouring plants not flowering at the same time. An improvement could be effected by selecting the best of ears and planting them in a special seed plot and selecting from the same plot yearly. Where difficulty was experienced with neighbouring crops fertilising the seed plot, a farmer should plant in the centre of his own crop. The size, height and conditions under which the stalk was grown should be considered in selecting. Plants that had done well under adverse conditions, and had had to fight for their living, and yet yielded heavily, should be given preference. They were constitutionally stronger than others that had not done so well under similar conditions. In selecting ears, where two ears were found on one stalk no advantage had been found, except where the top ear was of normal size. In that case selection of plants with two ears made for better yields. When the stalks were very high, say, 16 feet, the cobs should be selected from stalks carrying them at a medium height, other things being equal, as the cob was then well within reach. The improperly-covered cob when standing erect on the stalk allows the rain and weevil to obtain ingress, the former causing mould and the latter consuming the germ. This was the case more especially in the northern districts. A thin spindly stalk should be avoided. Growers should not be misled into selecting seed from a crop from rejected or ordinary ears, however abundant it might be, as tests with ears from selected and unselected seed had proved beyond all doubt that the selected ears were ultimately far the best. The latest method of improving seed maize and increasing the yields was to take the very best ears and to sow each row with seed from each separate ear. This would test the individual performances of the ears. In tests carried out in this manner it had been found that from ears of the same variety and type the differences in yield ranged from 85 lb. to 225 lb. The Department's method was to plant half the seed of each ear, to select the good performers, and in the following year to use cobs from the best ears, and also the balance of the previous year's seed. Then cross-fertilisation took place only between varieties of approved and tested kinds. In the Government farms in New South Wales, the policy of growing one variety only was carried out, the variety grown at Hawkesbury Agricultural College being Red Hogan. He recommended that one or more men in the district should take up the systematic breeding of maize. Most of the established varieties had been raised by the system outlined. Most of the successful varieties were of American origin, and had been produced by practical farmers. Ten shillings per bushel was not too much to pay for carefully selected seed maize.

DISCUSSION.

Mr. A. HANNABUS thought uncovered husks were chiefly found with ears standing erect, and most prolific, and his experience was that a very small percentage only were found to be affected with mould or weevil.

Mr. WENHOLZ said that tests with the variety at the Hawkesbury Agricultural College (Red Hogan) had proved that it was undesirable to select improperly covered ears and erect standing ears. The variety grown by Mr. Hannabus might possibly carry the husk closely set and tightly drawn about the ear, and thus prevent the ingress of rain, but, notwithstanding that, it was always desirable to select well covered and drooping ears.

Mr. HANNABUS said the husks were very tightly drawn about the ears of the variety mentioned by him (King's Early Improved).

Yarramalong.

A meeting was held on 30th May, when a discussion took place on the advisability of holding a village show.

PURE SEED MAIZE—CO-OPERATION BY FARMERS.

OWING to the value of acclimatised seed maize, and the danger of its becoming impure in cross-fertilisation, it has been the policy of the Department, in order to ensure pure seed being available to farmers, to have only one variety grown at each Experiment Farm, where it undergoes systematic improvement for yield and quality.

As these Experiment Farms are not representative of every large maize-growing district in the State, the principle has been extended to include other districts, where this improvement system has been undertaken, under Departmental supervision, by the co-operation of reliable farmers in these districts.

In order to further extend this work and to cater for other important maize-growing centres, the Department would be glad to hear from farmers who are already specialising in, or who are willing to specialise in, the production of pure seed maize by co-operation with the Department.

The object of this is to get one or more reliable farmers in each district where there is no Experiment Farm to grow pure seed maize of a variety which is suited to the district, so that he can supply pure seed of good quality to farmers in that or any other district who may require it.

As varieties of maize cross-fertilise very readily, this would entail the growing of one variety only, or ensuring that this variety is not crossed by others, so that it may be kept pure.

A special seed plot, about an acre in area, planted with the best selected ears of the variety would be required, and where possible this plot could be utilised as an ear-to-row test or experiment to determine the best yielding types of ears of the variety. At the same time the variety would be improved in yield and quality.

Tests have shown that the yield of a variety has been increased by 10 bushels per acre by this system.

All communications should be addressed to the Under Secretary and Director, Department of Agriculture, Sydney.

Orchard Notes.

JULY.

W. J. ALLEN.

Ploughing.

THE winter ploughing should be commenced this month and completed by the early part of August, turning under farmyard manure (after being spread), all weed growth or any cover crops, so that they will have time to rot, and the plant food locked up in them thus be available for the trees when required. The land after ploughing will also catch the rains of the later part of the winter and spring, and allow the subsoil to get well soaked.

If a cover crop has not made much growth, ploughing should not be delayed with a view to getting a greater body of it to plough under, as this is a risky practice, because if the weather turns dry the cover crop will very quickly dry out the soil, and it is not only almost impossible to turn it under, but the trees are also robbed of moisture that should have been stored for their use in the soil and subsoil.

Moreover, the rotting of the crop will be slow, and, except in exceptionally wet springs, instead of doing good, the opposite effect will result from the cover crop.

A drag-chain should be used on the plough when turning under tall weeds or cover crops, so that they will be completely covered as far as possible by the plough. Instead of using a drag-chain, the crop can be rolled in lands in the same direction as the plough will follow.

Pruning.

This work should be pushed on this month. Apples and pears generally will have dropped their leaves, and will be in good condition for pruning. For the first few years after planting these trees require topping to get sufficient subdivision of branches and to control their direction; but when the scaffolding branches or main framework of the tree is well established, it is often best to cease topping the leaders, and merely thin them out to the desired number. The tree will then generally slacken in top growth, and develop its spurs better along the main limbs and laterals. Topping should be resorted to in later seasons, if the trees show too little vigour.

With most apples and pears the laterals will be found to develop spurs more readily if given good length or not shortened at all, especially the stronger ones: the very slender ones may be shortened slightly, as sometimes if left long they will only develop a spur or two on their tips. Laterals that were left long last year and have again made a fairly strong growth are better left long again, for, if brought back to the first spurs there is danger of starting these spurs into growth instead of cropping; it also checks the partially-formed spurs nearer the base from developing. Generally those laterals which have been left out for two seasons previously can be brought back to the spurs furthest from their base. Apples and pears often throw short laterals with fruit buds on the end, sometimes termed a fruiting shoot: these should be left as they are, as they will generally carry a crop and also develop spurs for future seasons. The spurs in old trees sometimes tend to subdivide too much and form a network of weak spurs; these should be thinned to keep a moderate supply of strong fruiting spurs. A pruner should always watch the results of his previous year's work. He will learn much from the tree he is working on.

Every tree has its own individuality, and therefore the grower should study their habits and prune them in such ways as will ensure that they will return him the best fruit from year to year.

The prunings are better picked up and burned as pruning proceeds, as then any fungus spores or eggs they may carry are destroyed.

This burning is most expeditiously accomplished by mounting an old iron tank on wheels, such as has been previously illustrated in these notes. The tank is open at the top and with a grating at the bottom.

Scions.

Scions of deciduous trees for spring grafting should be taken from healthy trees that have borne good crops of high-quality fruit. These may be kept in moist sand in a cool place till required. Scions can also be kept in cool store, and used for budding in the late spring.

Planting.

The planting of either new plantations or refills can be continued this month. Land should be prepared for the spring planting of citrus trees.

Manuring.

Slow-acting fertilisers such as bone-dust can be applied this month to give them time to decay, so that the plant food they contain will be available when the trees start growth in the spring. The application of the more soluble manures can be delayed till early spring.

Cleaning Stems.

Any loose rough bark should be removed from fruit trees, and any injurious insects they may harbour, such as the grubs of codlin moth and peach tip moths, destroyed.

Bandages.

Bandages which have been left on apple and pear trees since the fruit season, to trap any codlin grubs that look for better shelter after the cold and rain of winter sets in, may be removed and the grubs destroyed.

Spraying.

Peach Leaf Curl.—Peach trees should have a thorough application of winter strength lime-sulphur or Bordeaux mixture while the trees are dormant and *before* the buds show signs of swelling, to check attack of leaf curl. Such spraying has given excellent results at the Departmental Experiment Orchard at Yanco in combating curl, and also gave evidence of some control of rust. A report on these experiments appears on another page of this issue.

Most apples and pears can receive this winter application later. Where woolly aphis is present, tobacco wash can be added to the lime-sulphur with advantage.

Spraying with red oil for scale on deciduous trees and woolly aphis on apple trees should be done during the latter part of this month.

Brown Spot of Mandarin.

Although we do not advocate the general pruning of citrus trees till the spring, it is advisable to cut out and burn all dead and diseased wood of Emperor mandarin trees that have been previously attacked by Brown Spot, so that they will be ready for their first spraying of Bordeaux mixture. Growers in districts where this variety is liable to Brown Spot should read the report in the *Agricultural Gazette* of March, 1917, on the results of the experiment carried out by the Department on the control of this disease. These experiments have been carried further, and the results confirm those given in the former report.

Harvesting.

In districts where oranges do not hang well, the bulk of the crop will have to come off this month; and even in the later-hanging districts, if prices warrant it, it is a good plan to lighten the trees by marketing the largest fruit, after it has coloured, throughout the season.

Lemons should be picked regularly as they come up to size. If prices are not satisfactory, and they are grown in districts that will produce a keeping lemon, they can be stored away in boxes; the peel will reduce considerably in size, and they can be marketed when prices warrant.

But it must be remembered that a lemon should be cut from the tree and handled with the greatest care to avoid bruises if it is to be stored, otherwise decay will set in.

The same applies to oranges intended for shipping. When packing either for the home market or for shipping, size and grade should be uniform throughout a case.

NOTE ON THE JUICE OF THE CHOKO (*Sechium edule*).

THE following note on the juice of the Choko is sent to me by Mr. Ernest W. Smith, of Bexley, near Sydney, and I should be glad if any of your readers could throw any light on the subject. Mr. Smith says:—

> A few weeks ago my wife informed me that when she was peeling a choko her hands became numb, and she thought that her hands were becoming paralysed. A fortnight afterwards she told me that the same thing happened again under similar circumstances, and I came to the conclusion that the juice of this vegetable must have local anæsthetic properties. I have since had this opinion confirmed from questions I put to another lady whose experience was the same. I feel sure that the concentrated juice of this vegetable would prove a very powerful and valuable local anæsthetic.

I may say that on speaking to a member of my household on the subject she at once replied that the peeling of Chokos makes her hands cold and rough, and therefore she always uses a fork in order that she may touch them as little as possible.—J. H. MAIDEN.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
National A. and I. Assn. of Queensland (Brisbane)	J. Bain	Aug. 12–17
Trundle P. and A. Association	W. E. Herborn	,, 13, 14
Corowa P., A., and H. Society	J. D. Fraser	,, 20, 21
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 27, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 3, 4
Grenfell P., A., and H. Association	G. Cousins	,, 3, 4
Albury and Border P., A., and H. Society	W. I. Johnson	,, 3, 4, 5
Ganmain A. and P. Association	T. S. Henderson	,, 10, 11
Young P. and A. Association	T. A. Tester	,, 10, 11, 12
Cowra P., A., and H. Association	E. W. Warren	,, 17, 18
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 17, 18
Narrandera P. and A. Association	J. Faulkner	,, 17, 18
Temora P., A., H., and I. Association	A. D. Ness	,, 17, 18. 19
Burrowa P., A., and H. Association	W. Burns	,, 19, 20
Holbrook P., A., and H. Society	J. S. Stewart	,, 19, 20
Canowindra P., A., and H. Association	H. M. Brown	,, 24, 25
Henty P. and A. Society	H. L. Yates	,, 24, 25
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25
Yass P. and A. Association	E. A. Hickey	,, 26, 27
Narromine A. H. and P. Society	C. E. Skinner	Oct. 1, 2
Junee P., A., and I. Association	T. C. Humphreys	,, 1, 2
Ardlethan and District P. and A. Society	W. J. Nixon	,, 2
Eugowra P., A., and H. Association	R. A. Douglas	,, 2
Deniliquin P. and A. Society	P. Fagan	,, 2
Hay P. and A. Association	G. S. Camden	,, 9, 10
Lismore A. and P. Society	H. Pritchard	Nov. 20, 21

1919.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	H. G. Fraser	Jan. 15, 16
Kiama Agricultural Society	G. A. Somerville	,, 25, 27
Dapto A. and H. Society	F. James	,, 31; Feb. 1
Shoalhaven A. and H. Association (Nowra)	H. Rauch	Feb. 13, 14
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 25, 26, 27
Inverell P. and A. Association	J. T. Dale	,, 25, 26, 27
Newcastle A., H., and I. Association	E. J. Dann	,, 26, 27, 28; March 1
Tenterfield P., A., and M. Society	R. S. Smith	Mar. 4, 5, 6
Cootamundra A., P., H., and I. Association	N. Gardner	,, 11, 12
P. and A. Assn. of Central New England (Glen Innes)	G. A. Priest	,, 11, 12, 13
Armidale and New England P., A., and H. Assocn.	A. McArthur	,, 18, 19, 20, 21
Hunter River A. and P. Association	E. H. Fountain	,, 26, 27, 28, 29
Quirindi District P., A., and H. Association	A. Pountney	April 2, 3, 4
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 9, 10
Moree P. and A. Society	A. U. Ezzy	May 21, 22, 23

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1918.

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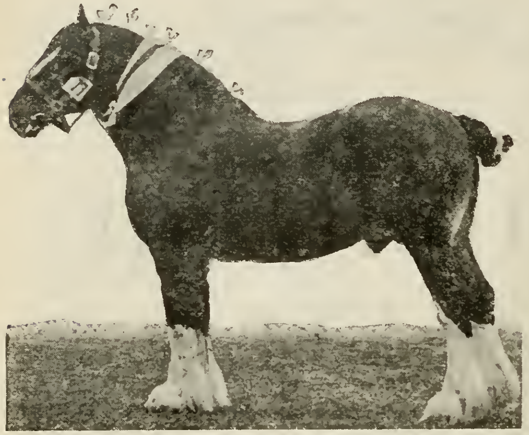
DEPARTMENT OF AGRICULTURE, NEW SOUTH WALES

Imported Clydesdale Stallions.

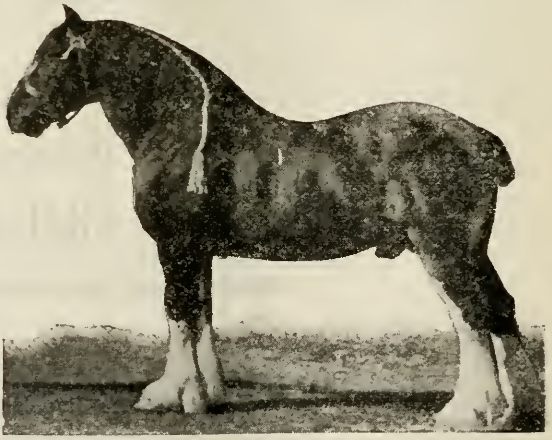


Clandale was awarded FIRST PRIZE at the Northern Show at Aberdeen, Scotland, in 1912; and in 1918 was awarded the £100 CHAMPIONSHIP PRIZE at the Royal Show, Sydney.

CLANDALE (14628). C.S.B.

Sire, Allandale (12418), C.S.B., by Sir Hugo.
1st Dam, May Logan (21199) C.S B., by Prince Robert (7135 , C.S.B.
2nd Dam. Haidee (21198), C.S.B., by Prince of Wales (673) C.S.B.
3rd Dam, Jess of Portlogan (3145), C.S.B., by Lofty (460), C.S.B.
4th Dam, Kate, by Hercules (378), C.S.B.

Royal Warden was awarded FIRST and CHAMPION PRIZES by the Royal Agricultural Society of England as a 3-year-old.



ROYAL WARDEN (16045). C.S.B.

Sire, Everlasting (11331), C.S.B., by Baron's Pride (9122), C.S.B.
1st Dam, Gem of Craigwillie (21597), C.S.B., by Prince of Thomas (16262), C.S.B.
2nd Dam, Lady Edith of Craigwillie (15687), C.S.B., by Prince Currachan (8151), C.S.B.
3rd Dam, Jean of Northfield (18564), C.S.B., by Star of the North (2435), C.S.B.
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2nd August, 1918.

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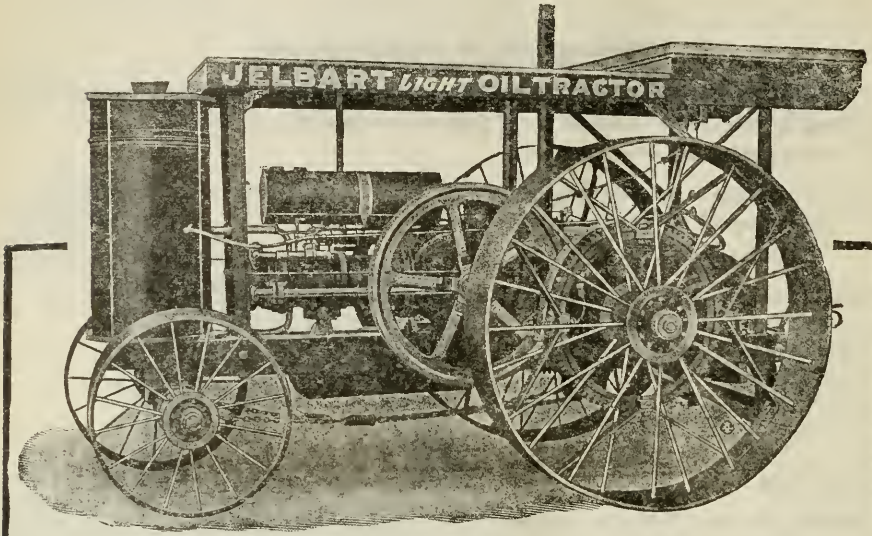

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VOL. XXIX. PART 8. AUGUST 2, 1918.

Agricultural Gazette of New South Wales.

Pop Corn.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

POP CORN belongs to a group or race of maize known botanically as *Zea mays everta,* on account of its tendency to evert or turn inside out on the application of heat. It is a delicacy which is greatly enjoyed by children, and deserves some encouragement because of its food value and its wholesomeness compared with many other sweets which are craved for at times by young people. It is also of interest on account of the amusement it affords in the actual operation of popping. The display of varieties of pop corn of different colours made by the Western District in the district competition exhibit at the Royal Agricultural Show, in Sydney, 1918, also showed its usefulness for decorative purposes with farm products.

In the United States of America over 11,000 acres of pop corn were grown in 1909. Iowa and Nebraska are the States where it is most largely grown, the former State having an area of 5,345 acres under the crop in that year.

The culture of the crop in New South Wales is practically confined to a few home or farm gardens, and almost the whole of our product is obtained from America each year by local pop corn manufacturers, who import the grain and do their own popping. There is no reason for this dependence on America, for pop corn will grow well in most of our maize districts, and at the present time, with shipping freight so high, it is hoped that it will be recognised that it is a profitable crop, and can be made to continue to be so.

It is estimated that the trade in Sydney will take annually about 2,000 bushels of corn for popping, and that there is every likelihood of a good market in the neighbouring States and New Zealand. At the present time manufacturers in Sydney are prepared to give at least 14s. or 15s. per bushel for shelled pop corn.

Distinguishing Characters of Pop Corn.

Pop corn differs from other maize in its smaller and more slender growth of stalks, smaller cobs, and smaller grain. Six or 7 feet is a good growth of stalk for pop corn, where dent maize will grow 12 or more feet. The ears of pop corn are seldom longer than 8 or 9 inches at their best, and the size of the grain is such that it takes from 2,000 to about 3,000 to weigh a pound.

The grain itself is more like flint than dent maize in composition, but has even less soft starch than flint maize. It consists almost entirely of germ and horny starch. The best pop corn should show but little trace of soft or white starch, at least on the exterior of the grain.

The cause of popping is not thoroughly understood, but it is supposed to be due to the expansion of air and moisture inside the grain. The uniform consistency of the endosperm seems to have something to do with the turning inside out of the grain on popping. The expanded air and moisture seems to suddenly find an outlet through the tip or germ of the grain. If the grain is not sufficiently dry weak points are found, through which the expanded air and moisture escapes before attaining sufficient force to evert or pop the kernel.

Types and Varieties.

There are two easily distinguished types of pop corn—the rice type and the pearl type. The former has the crown of the grain drawn out into a sharp beak or projection, and the latter has a smooth rounded crown on the grain. Neither type has any dent in the crown. The two best-known varieties of the rice type are White Rice and Red Rice, while there seems to be a larger number of the pearl type. These varieties are distinguished mainly by the colour and the time of maturity, though one known as Eight-rowed differs appreciably from most of the others of the pearl type, in having long ears with only eight rows of large grain. The best-known varieties of the pearl type are White Pearl and Mapledale Prolific (white), Queen's Golden and California Yellow (yellow), and Black Beauty (black).

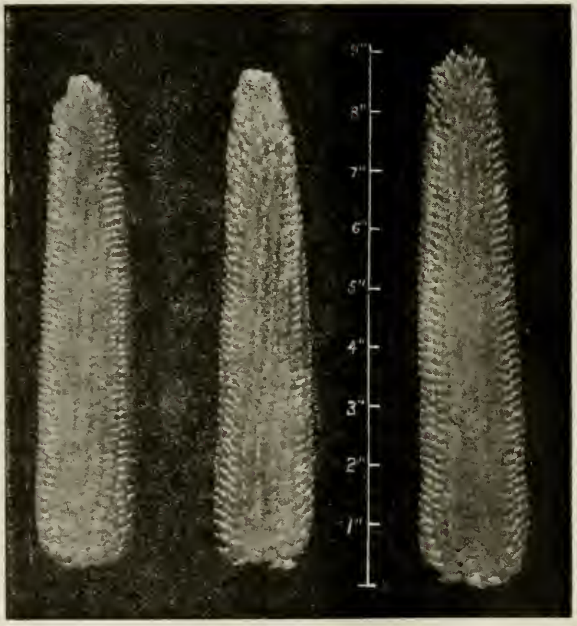

Fig. 1.—White Rice Pop Corn.

White Rice and the White Pearl types are the most popular varieties at present for growing on a commercial scale, for it is believed that the coloured varieties are not popular with the pop corn manufacturers. The coloured varieties are quite suitable for the home garden, and for decorative purposes, and some of them when popped hide the coloured skin or gluten better than others.

Of the varieties tested at Peel in 1917, Black Beauty matured in about four and a half or five months, Queen's Golden a fortnight later, while White Rice and Mapledale Prolific were fully two or three weeks later still. These periods would be shortened by three or four weeks when grown on the coast.

The average yield of this test plot of varieties, which was conducted on upland red granite soil, with a rainfall of 9 inches during growth, was estimated to be between 25 and 30 bushels per acre, and the best yielding varieties to be White Rice, Mapledale Prolific, California Yellow, and Black Beauty, in that order.

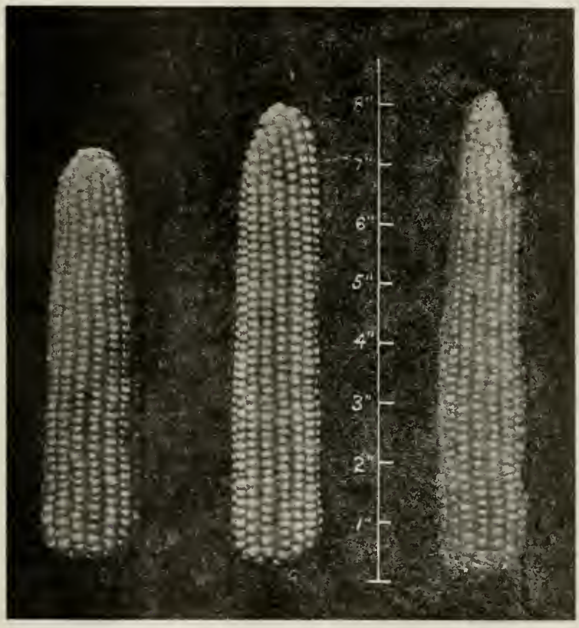

Fig. 2.—Mapledale Prolific Pop Corn.

The Soil and its Preparation.

The best soil for pop corn is undoubtedly the same as the best soil for field maize—a rich, warm, well-drained soil, where the conditions of moisture and fertility favour continuous growth during the entire season. Alluvial soils, of course, best fulfil these conditions; but it is thought that, from the smaller nature of the growth of pop corn, compared to field maize, that it is not as exacting as the latter in these respects, and that profitable crops can be raised on soils of lesser fertility.

Any soil can, however, be considerably improved in moisture-holding capacity and plant-food material by the addition of stable or farmyard manure, or by the incorporation of green vegetable matter in large quantities from the ploughing in of green crops (especially legumes like peas, vetches, clover, &c.). The plant-food material can also be largely augmented by the application of fertilisers. From experiments conducted by the Department during the last few years, it is becoming apparent that no fertiliser or mixture of those that are available at the present time, within reach of the farmer's pocket, is giving such profitable returns on the coast as a mixture of equal parts of superphosphate and bone-dust, at the rate of 2 cwt. per acre, which can be applied at a cost of about 15s. per acre. It is possible that where there is an abundance of organic matter and nitrogen in the soil, the addition of superphosphate only is required, at the rate of 2 cwt. per acre, at a present cost of about 10s. per acre.

The soil should be given a deep ploughing or working some time before sowing, preferably a winter fallow before spring planting, and should be somewhat firmed into a good seed-bed of finer particles of soil, with a loose surface, through which the young plants can readily push their way.

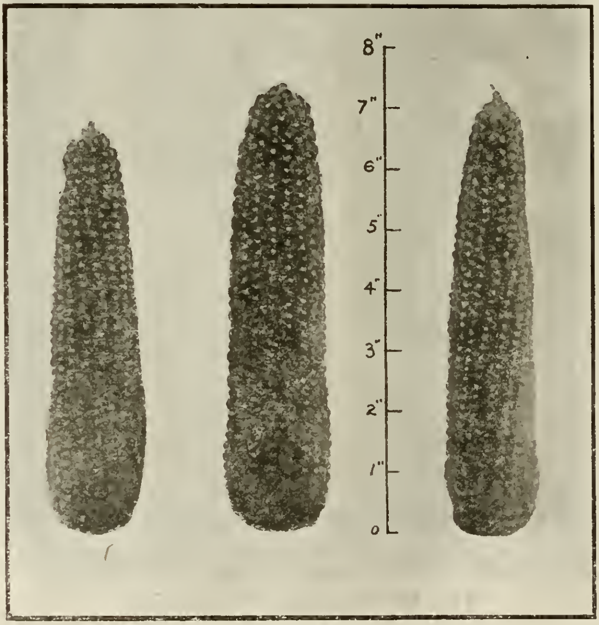

Fig. 3.—Queen's Golden Pop Corn.

Planting and Cultivation.

It is essential that pop corn should fully mature in order to pop properly, as when the filling of the grain is checked by frost or cold weather it gives an unsatisfactory sample for popping. Planting should therefore take place early, especially in cold, short-season districts like the Tablelands. Pop corn does not seem to suffer as much as other kinds of maize from spring frosts. This is probably due to the fact that it suckers more profusely than any other kind.

Owing to the smaller growth of pop corn, it may be sown closer than field varieties, the distance between the rows recommended being 3 to 4 feet, the lesser distance on the richer soils. Single grains may be sown about 10 or 12 inches apart, but better results will probably be obtained by sowing three or four grains every 2½ or 3 feet. This "hill" sowing keeps down the formation of suckers to some extent. On small areas the practice of sowing thickly, and subsequent thinning out to the required stand, can be well recommended if the weakest plants are removed in the thinning operation. Under this system six or seven grains should be sown in a hill, and when the plants are about 8 to 12 inches high the hills should be thinned to three or four plants, leaving only the most vigorous. By this means a rigorous selection is practised, which is well repaid for the trouble. It is becoming increasingly recognised with maize that little indication of the vigour of growth is given in the visible characters of the seed ears or of the seed; and this method of selection by elimination of the weak plants in the field can be confidently recommended on small areas of any kind of maize. Samples of White Rice pop corn usually contain from about 2,500 to 3,000 grains in 1 lb. by weight, so that the weight of seed required to plant an acre can be estimated for different districts, according to soil and climate.

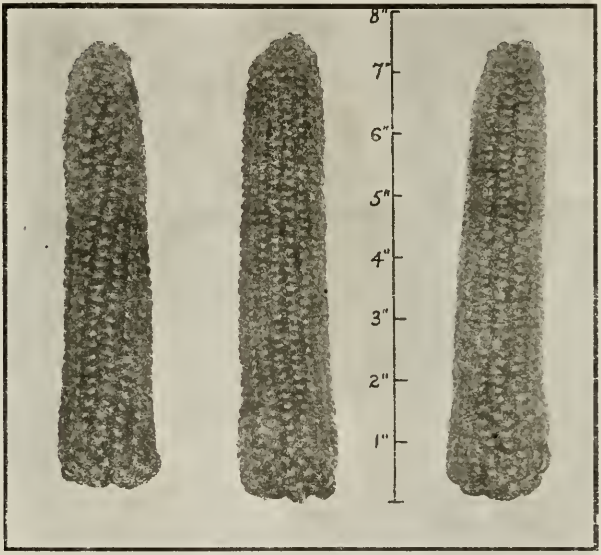

Fig. 4.—Black Beauty Pop Corn.

The grain should not be sown too deeply, especially with an early planting. From 1 to 2 inches is sufficient under most circumstances in early spring to get down to moisture. The surface should be harrowed lightly while the plants are small, and afterwards cultivated to a shallow depth to keep down weeds and to keep the soil loose. Owing to the small growth of pop corn, hilling is not required to hold the stalks up against the wind, but it may be advisable on rich land, with abundant moisture and fertility, to smother suckers or weeds.

Harvesting and Storing.

Pop corn should be allowed to thoroughly mature on the stalk. It should not, under any circumstances, be harvested immature. The maturing period of pop corn is longer than would be expected from the size of stalk, growth, and the smallness of the grain. The maturing period of different varieties has been previously referred to.

The storage of pop corn with too high a percentage of moisture will cause the popping quality to be badly affected.

The insect pests, such as weevil and grain moth, which occur in stored grain, are most effectively dealt with by fumigation in a closed chamber with carbon bisulphide. The pop corn should be thoroughly dry at the time of fumigation, and the liquid should not be allowed to come into contact with the grain, owing to the commercial product containing impurities which affect the taste of the grain. It is best applied on cotton-wool or waste on top of the pile of grain, or down pipes inserted to different depths in the pile. The use of naphthalene (moth balls or flakes) is precluded on account of the impossibility of removing the flavour it imparts to the corn. On a smaller scale, successful treatment by heating can be easily done by pop corn manufacturers who have trouble from insect pests in storage with the ready means at their disposal. The heat required

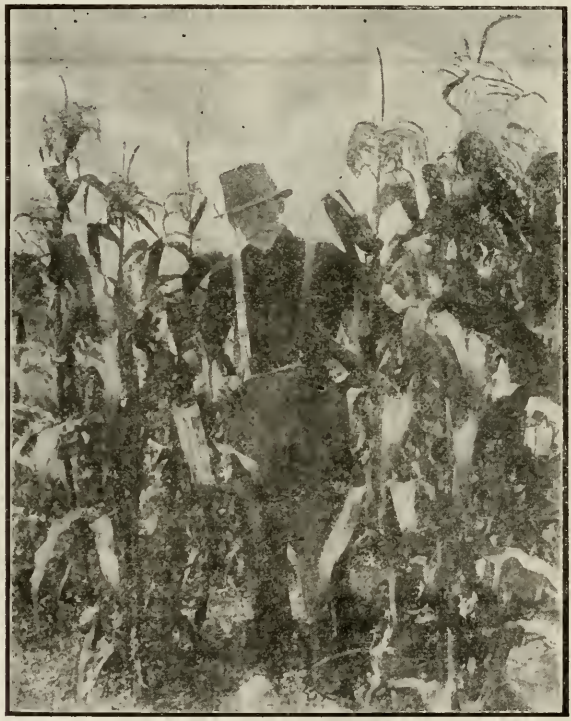

Fig. 5.—Growth of White Rice Pop Corn at Peel, 1917-18, on upland soil.

for this treatment is not as great as that required for popping, and besides being more effective than fumigation, the popping quality of the corn is unaffected. This treatment should take place in the spring, or as soon as the first sign of the pests is observed.

The Home Garden Plot.

Many home garden plots of pop corn are grown for the purpose of amusing children with the operation of popping, and at the same time providing a nutritious sweetmeat. The soil should be well enriched with stable manure some months in advance of sowing, and, owing to the manner in which the plants are pollinated, at least three rows should be grown, in order to get a good setting of grain. Single rows are always unsatisfactory in this respect. No sweet corn or field varieties should be sown in the vicinity unless a period of at least three weeks is allowed to elapse between the sowings of the different kinds, in order that they may be kept pure. Any admixture due to crossing affects the flavour of the pop corn as well as the popping quality. The rows should be 3 feet apart, and six or seven grains sown every 3 feet in the drill. This stand should be thinned out when the plants are about 8 or 10 inches high to about three plants every 3 feet, leaving only the strongest in each hill.

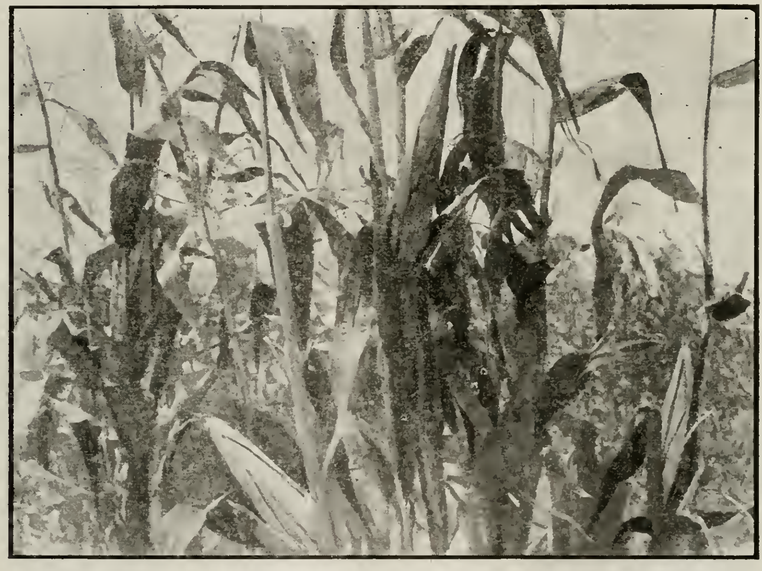

Fig. 6.—A single "hill" of White Rice Pop Corn, showing the profuse suckering nature.

Popping.

In order to get the corn to pop properly it must be thoroughly air-dry, *i.e.*, containing about 12 to 14 per cent. of moisture. If too moist, a lot of charred and swollen corn will be the result. It may sometimes happen that the corn has become too dry for successful popping. This is easily remedied by either sprinkling with or soaking in water, and subsequent air-drying.

The source of heat should be fairly strong. A glowing bed of coals gives the best results with the open-wire poppers, where a flame fire is objectionable on account of the ease with which the grains may be scorched. Where a pan popper is used, a flame fire is all right. A large amount of corn should not be put into the popper at once (just enough to cover the bottom of the popper), and the popper should be kept constantly agitated to prevent burning or scorching of the grain. Popping should take place in about a minute and a half with the right degree of heat and good corn. The popped product has from ten to twenty times the bulk of the original corn.

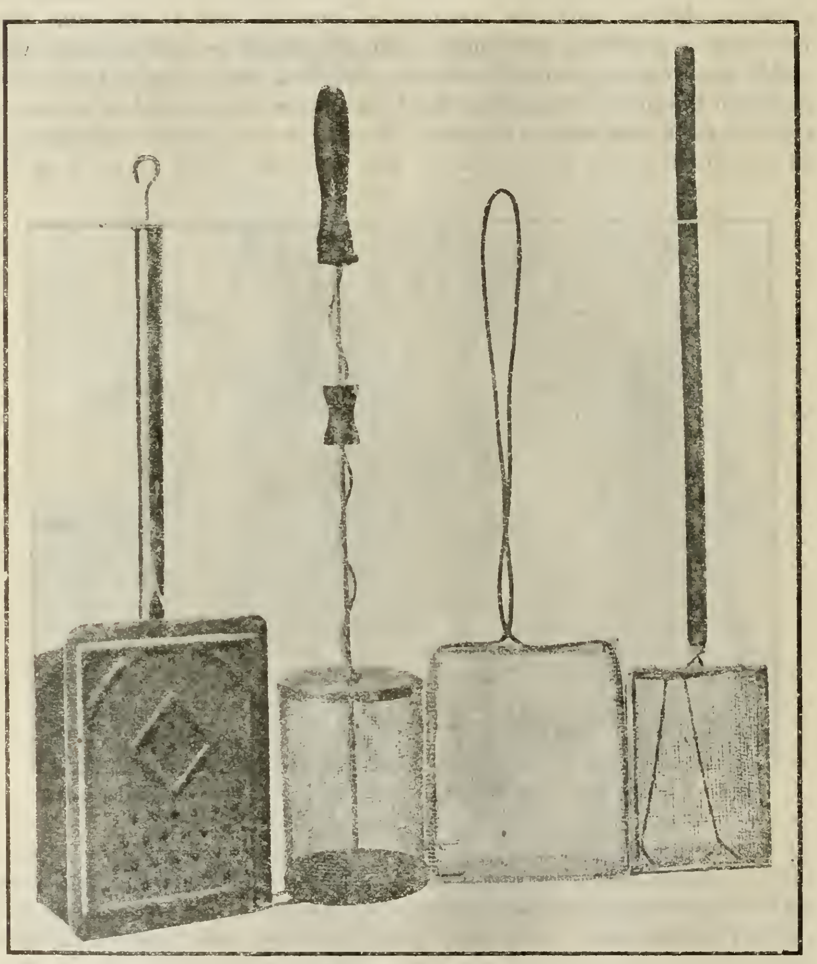

Fig. 7.—Different types of hand poppers.

(From U.S. Dept. Agr. Farmers' Bulletin 553.)

Uses of Popped Corn.

Popped corn is chiefly used as a form of confectionery. The application of heat in popping has the effect of breaking down the fibre in the grain to a large extent, thus rendering it more digestible.

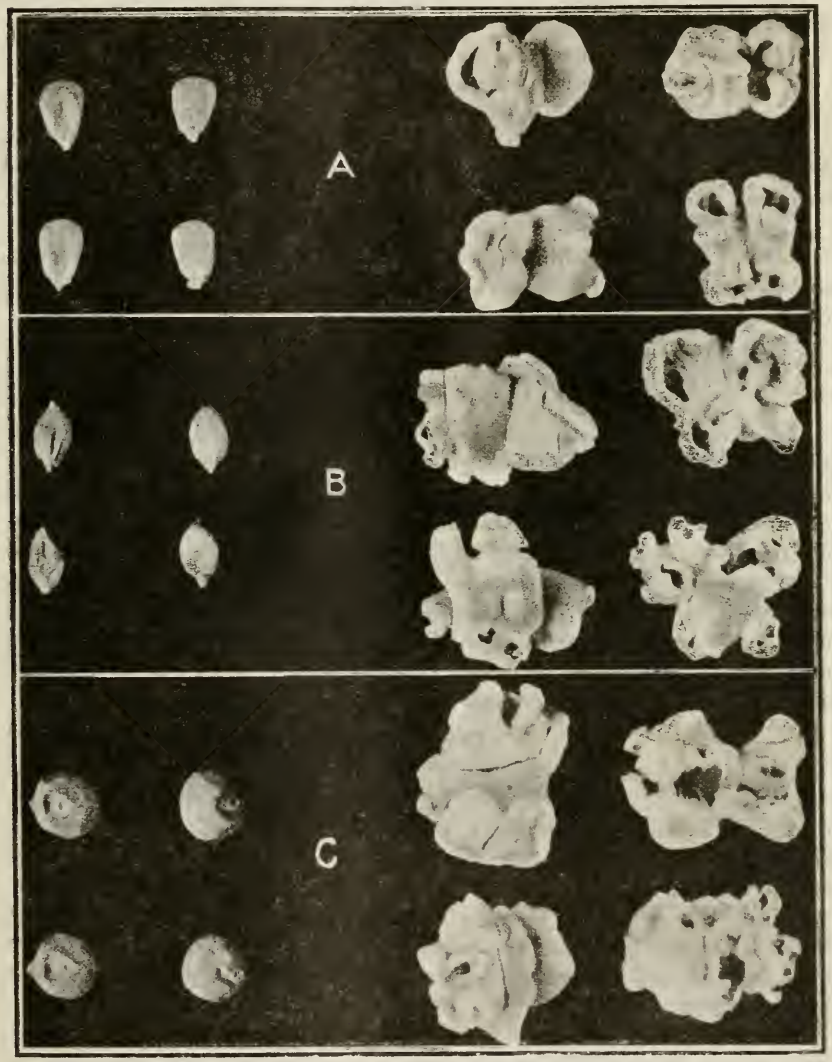

Fig. 8.—Unpopped and Popped Corn.
A—White Pearl. B—White Rice. C—Eight-rowed.
(From U.S. Dept. Agr. Farmers' Bulletin 553.)

The addition of a little salt after popping is usually required, and most of the popped corn sold by confectioners also has a coating of melted butter and sugar to improve its flavour. Popped corn also makes a good breakfast food when used with milk and sugar. In nearly all cases there will be a small percentage of parched unpopped grains left after popping. These can be well used as a breakfast food by boiling and serving with milk or cream and sugar.

The following recipes are given by U.S. Dept. Agriculture, Farmers' Bulletin 553:—

Chocolate Pop Corn—

2 teacupfuls white sugar.	2 oz. chocolate.
½ cup corn syrup.	1 cup water.

Put these ingredients into a kettle (pot) and cook them till the syrup hardens when put in cold water. Pour over 4 quarts crisp, freshly-popped corn, and stir well to ensure uniform coating of kernels.

Sugared Pop Corn—

Make a syrup by boiling together two cups granulated sugar and one teacup water. Boil until syrup strings from spoon or hardens when dropped into cold water. Pour over freshly-popped corn (6 quarts) and stir well.

Pop Corn Balls—

1 pint syrup or molasses.	2 tablespoonfuls butter.
1 pint sugar.	1 teaspoonful vinegar.

Cook till syrup hardens when dropped into cold water. Remove to back of stove, and add half a teaspoonful of soda dissolved in a tablespoonful of hot water, and then pour hot syrup on 4 quarts freshly-popped corn, stirring till each kernel is well coated, when it can be moulded into balls or any desired form.

Popped corn loses its crispness readily after popping, on account of absorption of moisture from the air. With the loss of the crispness the flavour also largely disappears, so that popped corn should not be kept for any time to enjoy it at its best. For this reason, popped corn is usually sold in waxed or oiled paper bags to prevent it absorbing moisture.

Conclusion.

All the maize-growing districts of the State where other maize matures can be made to grow some variety of pop corn. Owing to the smaller growth it is thought that pop corn would not be as exhaustive on the fertility of the soil nor as particular in its moisture requirements in the soil as other maize.

During recent years a separate class has been included for pop corn in the schedule for the Royal Agricultural Society's Show at Sydney. In this class the best ten seed ears are required, and there has not been, to date, much competition.

The Department of Agriculture can supply the names of merchants who deal in pop corn, chiefly manufacturers to whom the grain can be sold direct. At the prices quoted it is going to be a good cash crop for a number of farmers. Owing to the ease with which the market can be over-supplied, intending growers are advised to make a contract with the manufacturer or agent at the beginning of the season to grow a certain area, and to sell at a fixed price to be agreed upon, in the vicinity of that previously quoted (*i.e.*, 14s. or 15s. per bushel).

Notes on the Wheats competing at the Royal Agricultural Society's Show.

EASTER, 1918.

F. B. GUTHRIE.

THERE was a falling off in the entries for the wheat competition this year compared with last year, only seventy-three individual exhibits being staged. The principal reason for this was that the growing-crop competition, competitors in which are asked to exhibit a bag of wheat at the Easter Show, was this year, owing to adverse conditions, only a small one, there being only about half the number of entries that there were in 1917.

The sum of £125 was donated in prize money, and special prizes were given for individual wheats such as Yandilla King, Hard Federation, and Federation. These prizes were only open to competitors who had not previously been prize-winners, it being hoped by this means to widen the field of prize-winners.

The grain on the whole was of good quality, though rather uneven owing to the change of weather at harvest time. There were several very fine samples exhibited. The harvest, as represented by the f.a.q. sample, was rather better than last season, the bushel weight being 58½ lb. as against 56¾ lb. for last season, which was the lowest yet struck. There was a considerable quantity of bleached wheat, owing to general rains in the latter part of December, and the quality of the grain suffered in consequence.

Among the prize-winners, Mr. Clark, of South Australia, has returned again to his position as first prizetaker in the Macaroni class. He also took the second prize in the Hard Red class.

By far the most successful exhibitor was Mr. J. B. Roach, of Gilgandra, who carried off four first prizes, as well as two second prizes. In addition, Mr. L. J. Roach, of Gilgandra, annexed the three special prizes for individual varieties, so that these two exhibitors carried off between them seven out of the total of ten first prizes.

Whilst Mr. J. B. Roach is to be congratulated on his well-merited success, the fact cannot be lost sight of that a more even distribution of the prize money is a factor in encouraging competition, and it was with the specific object of widening the list of winners and introducing fresh names that the three special novice classes were instituted.

The judges were Messrs. R. W. Harris (Gillespie Bros.) and G. W. Norris (Department of Agriculture), the milling of the samples being carried out by Mr. Norris.

The judging was carried out as in previous years. The bushel weights of all samples were first taken; the results are given in the second of the tables which follow. After careful inspection to eliminate inferior exhibits, those which were considered eligible for prizes were milled in the model mill of the Department of Agriculture, and the prizes finally awarded in accordance with their actual behaviour in the mill, points being assigned for the different milling characteristics.

The results of these tests are given in the table headed "Results of Milling Tests," in which the figures within brackets are the actual figures obtained, the others being the marks assigned.

The following notes are supplied by the judges :—

"The quality of the wheats is not as good as in previous years, though the Macaroni wheats are somewhat similar to those shown last year. The Strong Red is well represented, the number of entries having doubled. All the samples were of good appearance. There were seven samples of Marquis—one grown by Mr. G. H. Hubbard being particularly fine, and giving a good account of itself in the mill. A sample of Prelude grown by Mr. M. J. D'Arcy also milled well. The Australian Strong White class was very poorly represented, there being only two entries. A sample of Comeback, grown by Mr. J. B. Roach, was an excellent wheat, still retaining its hard horny texture. The Medium Strong class had a fair entry. In the Soft Wheat classes the judging was comparatively easy, there being one exhibit in every class standing out above the rest. A sample of Hard Federation, grown by Mr. L. J. Roach, is worthy of mention on account of its hardness and uniformity. For the collection of Farrer wheats there was only one entry. It, however, contained all good show wheats. In the collection of non-Farrer wheats, those exhibited by Mr. J. B. Roach were all good samples, and secured the prize, but Mr. D. A. Rich's collection was only four points behind."

TABLE showing average bushel-weights, gluten-content, and water-absorbing power of wheats of the "Strong White" and "Soft White" classes milled at the Royal Agricultural Society's Show, from 1905–1918.

Year.	Weight per bushel.		Gluten.		Flour Strength. (Water-absorption, quarts per 200 lb. sack.)	
	Strong White.	Soft White.	Strong White.	Soft White.	Strong White.	Soft White.
	lb.	lb.	per cent.	per cent.		
1905	63	64	10·0	9·7	46·6	45·2
1906	63¾	64½	11·0	9·8	48·5	45·7
1907	62½	66	9·3	8·3	48·4	45·4
1908	64½	65	12·2	10·2	52·5	46·4
1909	64¾	65¼	11·9	8·6	53·5	49·2
1910	64½	64	13·8	12·1	50·0	47·8
1911	64½	63½	12·5	11·0	53·4	47·0
1912	65	64	13·4	10·6	52·7	45·2
1913	67	65¼	15·2	11·7	53·1	46·9
1914	67¾	67	12·8	10·6	52·3	45·0
1915	67½	66½	13·1	12·4	53·8	45·7
1916	67¼	67¼	13·0	12·3	53·3	47·5
1917	66	67½	12·4	8·6	54·6	43·0
1918	67	65¾	*	10·2	*	44·5

* There were only two entries in the Strong White class in 1918, and these were readily differentiated by the judges without subjecting them to a milling test. The figures for gluten and flour strength are therefore not available.

WEIGHTS PER BUSHEL.

Catalogue No.	Variety.	Bushel-weight. lb.	Catalogue No.	Variety.	Bushel-weight. lb.
Class 918 (Macaroni Wheat).					
6593	Macaroni Spring	66·35	6596	Huguenot	65·3
6594	Indian Runner	66·35	6597	Kubanka	65·3
6595	Medeah	65·0			
Class 919 (Hard Red).					
6598	Marquis	65·39	6604	Prelude	65·2
6599	,,	65·7	6606	Marquis	67·3
6600	,,	65·39	6607	,,	63·9
6601	Cedar	68·2	6608	,,	66·6
6602	,,	66·0	6609	Cedar	67·3
6603	Huron	65·2			
Class 920 (Strong White).					
6610	Comeback	66·6	6611	Comeback	67·0
Class 921 (Medium Strong).					
6612	Florence	62·9	6621	Cleveland	65·4
6613	Warden	66·5	6622	Firbank	66·5
6614	Gold-return	65·2	6623	Canberra	65·1
6615	Warden	66·5	6624	Florence	66·8
6616	Federation	65·2	6625	Yandilla King	65·1
6617	Firbank	66·5	6626	Cleveland	65·1
6618	Florence	67·1	6627	Marshall's No. 3	63·9
6619	Yandilla King	66·1	6628	Yandilla King	65·4
6620	Federation	66·1			
Class 922 (Special Prize for Yandilla King).					
6629	Yandilla King	65·7	6632	Yandilla King	64·7
6630	,, ,,	65·2	6633	,, ,,	65·3
6631	,, ,,	64·9	6634	,, ,,	65·3
Class 923 (Special Prize for Federation).					
6635	Federation	64·6	6637	Federation	67·3
6636	,,	62·5	6639	,,	61·7
Class 924 (Special Prize for Hard Federation).					
6640	Hard Federation	64·1	6642	Hard Federation	65·1
6641	,, ,,	66·5			
Class 925 (Weak Flour).					
6643	Petatz Surprise	65·2	6645	Jade	65·5
6644	Steinwedel	66·0	6647	Currawa	66·0
Class 927 (Collection of Five Farrer Wheats).					
6648	Comeback	66·6	6648	Federation	67·3
,,	Florence	67·0	,,	Hard Federation	66·5
,,	Bobs	66·6			
Class 928 (Collection of Five non-Farrer Wheats).					
6649	Yandilla King	64·9	6649	Marshall's No. 3	64·5
,,	Marquis	66·5	,,	Major	65·0
,,	Roseworthy	66·5			
6650	Pusa No. 4	67·1	6650	Petatz Surprise	66·8
,,	,, 107	66·5	,,	Currawa	65·7
,,	,, 110	65·8			
6651	Marshall's No. 3	64·2	6651	Warden	65·1
,,	Roseworthy	65·2	,,	Yandilla King	65·0
,,	Moira	64·7			

RESULTS OF MILLING TESTS.

	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of dry Gluten.	Strength.	Total.
Maximum Points.	10	15	10	10	15	20	2	100
Catalogue No.								
Class 919 (Strong Red).								
6602	10	*[66·0]* 13	8	*[73·0]* 10	14	*[13·3]* 16	*[50·2]* 16	87
6601	10	*[68·2]* 15	8	*[70·6]* 8	15	*[9·6]* 14	*[50·0]* 16	86
6606	9	*[67·3]* 14	8	*[70·4]* 8	14	*[13·1]* 16	*[48·2]* 15	84
6608	9	*[66·6]* 14	8	*[72·3]* 9	14	*[11·3]* 15	*[46·8]* 14	83
6604	8	*[65·2]* 13	8	*[72·5]* 10	13	*[14·0]* 16	*[45·6]* 13	81
6603	8	*[66·2]* 13	8	*[71·5]* 9	12	*[13·4]* 16	*[44·4]* 13	79
Class 921 (Medium Strong Flour).								
6624	10	*[66·8]* 14	9	*[70·9]* 8	14	*[12·2]* 15	*[49·0]* 16	86
6626	9	*[65·1]* 13	10	*[74·1]* 10	15	*[11·0]* 15	*[44·0]* 13	85
6619	8	*[66·1]* 13	10	*[72·7]* 10	14	*[13·7]* 16	*[44·6]* 13	84
6618	8	*[67·1]* 14	9	*[71·6]* 9	13	*[13·2]* 16	*[46·2]* 14	83
6613	10	*[66·5]* 14	10	*[71·4]* 9	11	*[11·4]* 15	*[42·1]* 11	80
Class 922 (Special Yandilla King).								
6630	10	*[65·2]* 13	10	*[71·2]* 9	12	*[10·1]* 14	*[46·0]* 14	82
Class 923 (Special Federation).								
6637	10	*[67·3]* 14	10	*[72·8]* 10	12	*[10·5]* 14	*[44·0]* 13	83
Class 924 (Special Hard Federation).								
6641	10	*[66·5]* 14	10	*[71·6]* 9	13	*[11·5]* 15	*[48·5]* 15	86
Class 925 (Weak Flour).								
6645	9	*[66·0]* 13	10	*[73·9]* 10	14	*[9·6]* 14	*[44·3]* 13	83
6647	9	*[66·0]* 13	10	*[69·4]* 7	15	*[10·4]* 14	*[44·3]* 13	81
6644	8	*[66·0]* 13	10	*[71·2]* 9	12	*[10·5]* 14	*[45·0]* 13	79

Awards.

Class 918— Macaroni.	First Prize, No. 6594—W. Clark; Indian Runner; grown at Angle Vale, South Australia, on sandy soil; seed per acre, 75 lb.; yield per acre, 20 bushels; no record of rainfall; fallow. Second Prize, No. 6597—J. B. Roach; Kubanka; grown at Gilgandra, on sandy loam; seed per acre, 45 lb.; yield per acre, 18 bushels; rainfall during growth, 10·64 inches; autumn ploughing.
Class 919— Strong Red.	First Prize, No. 6602—J. M. D'Arcy; Cedar; grown at Berrigan, on red loam; seed per acre, 30 lb.; yield per acre, 17½ bushels; rainfall during growth, 16 inches; fallow. Second Prize, No. 6601—W. Clark; Cedar; grown at Angle Vale, South Australia, on sandy soil; seed per acre, 60 lb.; yield per acre, 16 bushels; no record of rainfall; fallow.
Class 920— Australian Strong White.	First Prize, No. 6611—J. B. Roach; Comeback; grown at Gilgandra, on sandy loam; seed per acre, 45 lb.; yield per acre, 18 bushels; rainfall during growth, 10·64 inches; autumn ploughing. Second Prize, No. 6610—D. and J. Gagie; Comeback; grown at West Wyalong, on clay soil; seed per acre, 60 lb.; yield per acre, 24 bushels; rainfall during growth, 14·2 inches; fallow.
Class 921— Medium Strong.	First Prize, No 6624—J. B. Roach; Florence; grown at Gilgandra, on sandy loam; seed per acre, 45 lb.; yield per acre, 18 bushels; rainfall during growth, 10·64 inches; autumn ploughing. Second Prize, No. 6626—R. H. Thackeray; Cleveland; grown at Young, on red loam; seed per acre, 45 lb.; yield per acre, 28 bushels; rainfall during growth, 23·95 inches; fallow.
Class 922— Special Prize, Yandilla King.	No. 6630—L. J. Roach; grown at Gilgandra, on red soil; seed per acre, 50 lb.; yield per acre, 36 bushels; rainfall during growth, 10·6 inches; fallow.
Class 923— Special Prize, Federation.	No. 6637—L. J. Roach; grown at Gilgandra; seed per acre, 50 lb.; yield per acre, 30 bushels; grown on red soil; rainfall during growth, 10·6 inches; fallow.
Class 924— Special Prize, Hard Federation.	No. 6641—L. J. Roach; grown at Gilgandra, on red soil; seed per acre, 50 lb.; yield per acre, 30 bushels; rainfall during growth, 10·6 inches; fallow.
Class 925— Weak Flour.	First Prize, No. 6645—E. Pyne; Jade; grown at Mudgee, on red soil; seed per acre, 60 lb.; yield per acre, 29 bushels; rainfall during growth, 15 inches; fallow. Second Prize, No 6647—J. B. Roach; Currawa; grown at Gilgandra, on sandy loam; seed per acre, 45 lb.; yield per acre, 30 bushels; rainfall during growth, 10·64 inches; autumn ploughing.
Class 927— Special Prize, Five Farrer Wheats.	No. 6648—J. B. Roach; grown at Gilgandra, sandy loam; seed per acre, 45 lb.; yields per acre—Comeback 18 bushels, Florence and Bobs 20 bushels, Federation 32 bushels, Hard Federation 30 bushels; rainfall during growth, 10-6 inches; autumn ploughing.
Class 928— Special Prize, Five non-Farrer Wheats.	No. 6650—J. B. Roach; grown at Gilgandra, on sandy soil; seed per acre, 60 lb.; yields per acre—Pusa No. 4, No. 107, and No. 110, 20 bushels; Petatz Surprise, 18 bushels; Currawa, 30 bushels; rainfall during growth, 10.64 inches autumn ploughing.

Popular Descriptions of Grasses.

[Continued from page 395.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE ERAGROSTIS GRASSES.

This is a very large genus of grasses, and over 200 species are distributed over different parts of the world. Only about twenty are indigenous to Australia, but they constitute a considerable portion of the herbage. They like warm situations, and are generally absent from the elevated portions of the State, particularly where the winter is a long one. In such a climate as that of Glen Innes, where the days become warm in the spring, the Eragrostis grasses are fairly common in the summer season. On the Southern Tablelands, on the other hand, where cold days extend well into the summer months, the perennial Eragrostis grasses are rather rare. Both there and on the Central Tablelands they are mostly introduced annuals, growing rapidly during the warmer months of the year, and disappearing with the first frosts.

The Eragrostis grasses are never very large. They are characterised by either very tender or very narrow leaves, and by a slender stem with usually a profuse amount of seed-head. The seed spikelets generally overlap each other, like the slates of a roof, and each spikelet contains an extremely small seed. In appearance, particularly in the inflorescence, they closely resemble the Poas, but may be distinguished from the latter by the larger number of flowers in each spikelet, and by the fact that the flowering glume has, as a rule, three nerves instead of five, as in the Poa group. The seeding qualities are particularly good, and on account of the large quantity of small but ripe seed produced they are able to maintain their permanence in a pasture.

The Eragrostis grasses will grow in all kinds of soil formations, but are often able to crowd out other grasses on poor soils. It is this fact, combined with their comparative succulence and palatability, that sometimes renders them of great value. Those on the coast and Northern Tablelands, including *Eragrostis leptostachya, E. Brownii,* and *E. diandra,* provide a large portion of the feed on many dairy farms, while the Eragrostis grasses of the interior, with their woolly roots and wiry leaves, are particularly valuable on account of their extreme resistance to drought, which enables them to provide a large amount of sheep-feed during dry periods.

Owing to the smallness of the seed and its comparatively high viability, many Eragrostis grasses have become introduced from America and elsewhere. Particularly is this the case with Stink grass (*Eragrostis major*), which is becoming an absolute pest on cultivated lands. It is of such a

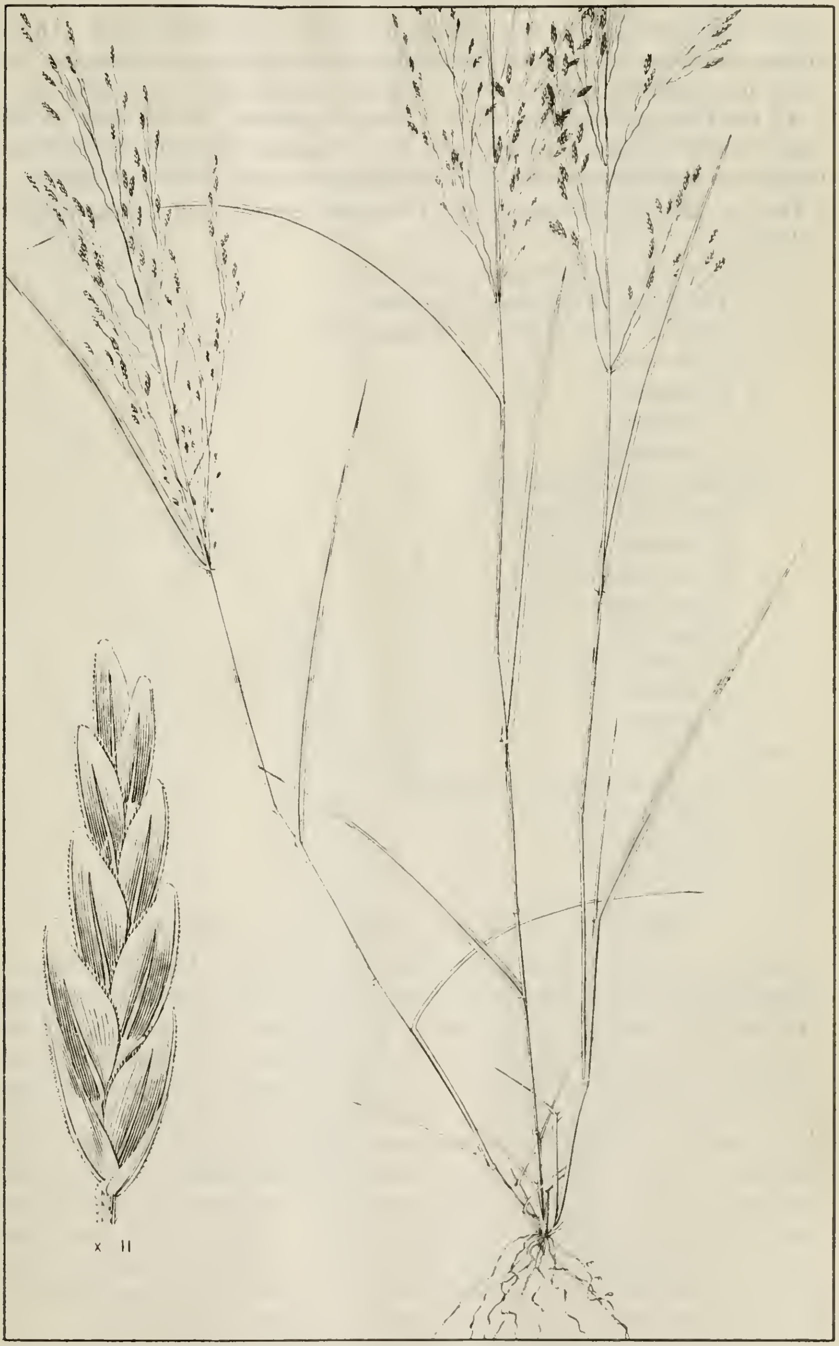

Fig. 1.—Teff Grass (introduced), *Eragrostis abyssinica.*
Note the slender inflorescence, somewhat akin to that of *E. pellucida*, but much more drooping than in that grass.

POPULAR DESCRIPTIONS OF GRASSES.

short-lived character that it is practically useless as a fodder plant. Other grasses which are also rapidly establishing themselves in this manner, but which have a higher fodder value, are *E. pectinacea* and *E. neomexicana.*

All the Eragrostis grasses are of a hardy character. While those on the coast sometimes grow in extremely dry situations, those in the interior receive the well-known names of Everlasting grass and Never-fail grass.

For the sake of convenience the Eragrostis grasses may be classified as follows:—

Good Pasture or Cultivated Varieties—
  Teff grass (*Eragrostis abyssinica*).
  Paddock Love grass (*E. leptostachya*).
  E. Brownii.
  E. diandra.
  E. curvula.
  E. pellucida.
Drought-resistant Varieties—
  Eragrostis leptocarpa.
  E. lacunaria.
  E. trachycarpa.
  E. speciosa.
  E. laniflora.
  E. chætophylla.
  E. falcata.
  E. tenella.
Weeds—
  Stink grass (*Eragrostis major*).
  E. neomexicana.
  E. pectinacea.
  E. purshii.

TEFF GRASS (*Eragrostis abyssinica*). (Fig. 1.)

This is a grass that is native to northern and tropical Africa, and that is spoken highly of in Transvaal and South Africa. As far back as 1887 seed was obtained from Abyssinia by the Royal Botanic Gardens, Kew, and distributed to various botanic gardens and other institutions in India and the colonies, including Natal. Favourable reports were received from British Guiana, India, Australia, and Natal, but, owing probably to lack of co-operation and supervision, the grass nowhere obtained the status of a farm crop. It is to Mr. J. B. Davy, recently Agrostologist in South Africa, that the success of Teff grass is principally due. He reintroduced the grass into the Union in 1903, and by 1910 hundreds of tons of hay were being sold on the Johannesburg and Pretoria markets. Yields as high as 4 tons of hay per acre have been recorded from that country. The hay is reported to be of an excellent quality, and all classes of stock do well on it.

Teff grass has been grown to a very large extent in Australia, principally in Queensland and New South Wales, and, although favourably reported

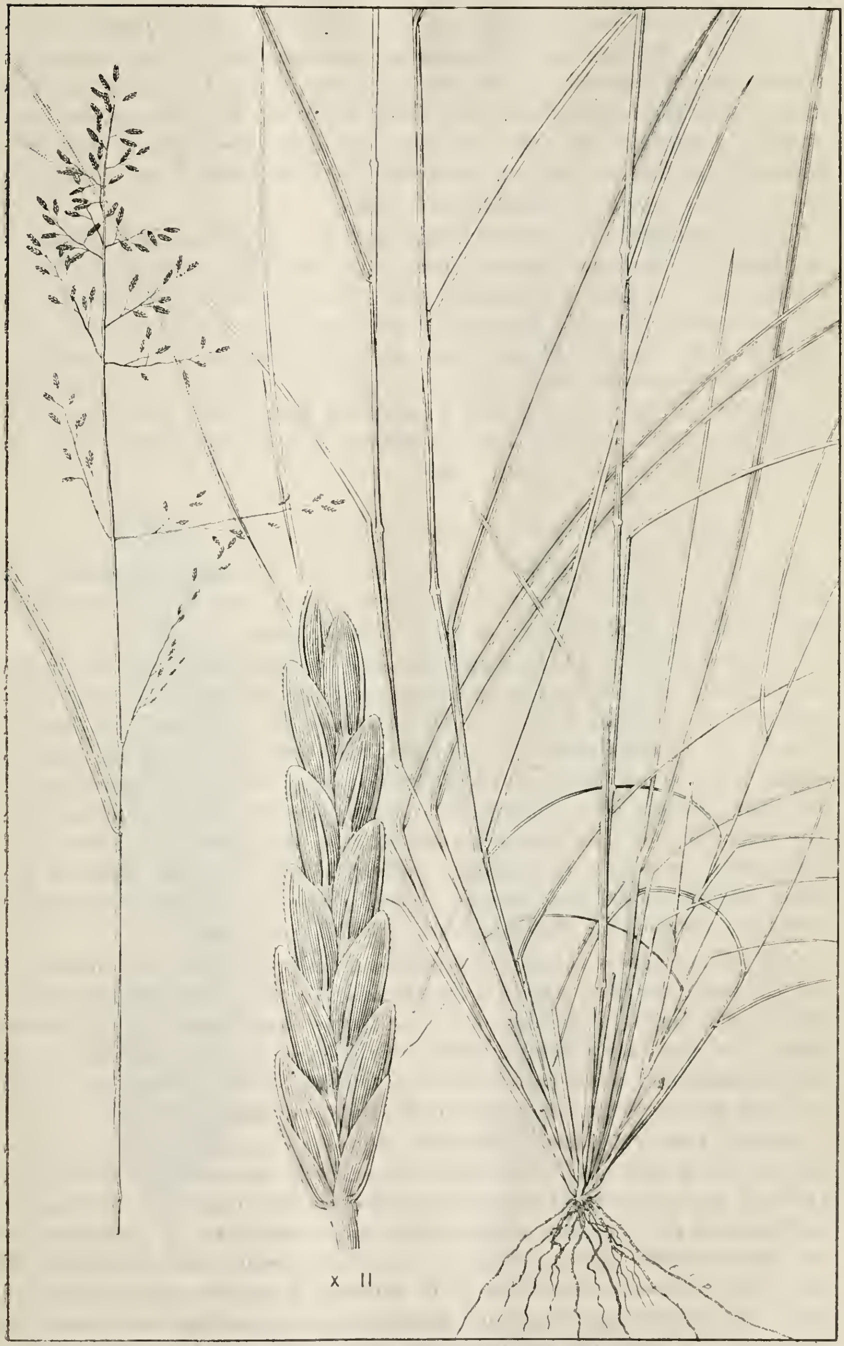

Fig. 2.—Paddock Love Grass (*Eragrostis leptostachya*).
Note the stiff character of the inflorescence ; a very prominent feature of this grass.

Popular Descriptions of Grasses.

on in many cases, has not increased in popularity. From Queensland in 1914 a yield of 2 tons 3 cwt. of hay per acre was recorded. A very important characteristic noticed there about the grass was its rapid growing qualities under favourable conditions; it was ready to cut for hay eight weeks from sowing. Although the grass has been reported elsewhere as drought-resistant, that has not been the experience in New South Wales, as it soon wilts when its supply of moisture is removed.

The success and the superior qualities of Sudan grass have put Teff grass completely in the shade during late years, and it is now doubtful if farmers will ever grow Teff grass in preference to Sudan. Whereas Teff is not particularly drought-resistant, Sudan grass is noted for just that quality. Sudan grass produces a much greater yield of hay, and in addition will stand a good deal of pasturing, which Teff will not. In a grazing experiment carried out at Yanco Experiment Farm, Teff grass was absolutely neglected for Sudan and the millets, and did not prove nearly as rapid in its growth as the Sudan grass.

PADDOCK LOVE GRASS (*Eragrostis leptostachya*). (Fig. 2.)

This grass is very common on the coast and Northern Tablelands. It may be distinguished from most Eragrostis grasses by its spreading inflorescence and the stiff nature of the flower stalks.

"Paddock Love" is a very applicable name for this grass, for it eventually finds its way into all pasture paddocks on the coast where the soil is of sandstone or clayshale formation. If native shrubs be cleared and burned in order to provide pastures, Paddock Love grass is one of the first to appear, and whereas such grasses as *Panicum parviflorum, P. marginatum,* and Stipa grasses were common among the shrubs, when the latter have been removed they soon disappear, and *Eragrostis leptostachya,* couch, and Parramatta grass take possession. This does not, of course, refer to the scrub growing on volcanic country, where *Paspalum dilatatum* eventually proves too vigorous for Paddock Love, or even couch grass.

Paddock Love grass is one of the principal pasture grasses in Cumberland and Illawarra districts, where it is extremely partial to the sandstone and clay formations. On the Permo-carboniferous sandstones of the Hunter River it is also very common, while on the Clarence River sandstones it takes possession of many open paddocks. On the Northern Tableland it will be found growing very vigorously on the lighter volcanic formations.

Paddock Love grass has considerable value as a pasture grass. It starts early in the spring, and in its young stages cattle are extremely fond of it. Although soon arriving at maturity, it possesses the property of continually producing at the base new shoots, which are sought after in preference to the mature stalks, and a paddock of it often presents the appearance of not being touched, even when it is carrying a considerable number of stock. The plant, too, is a heavy seeder, and new seedlings are constantly appearing. It holds its own fairly well with couch and Parramatta grass, and an association of couch grass with it produces results, from a dairying

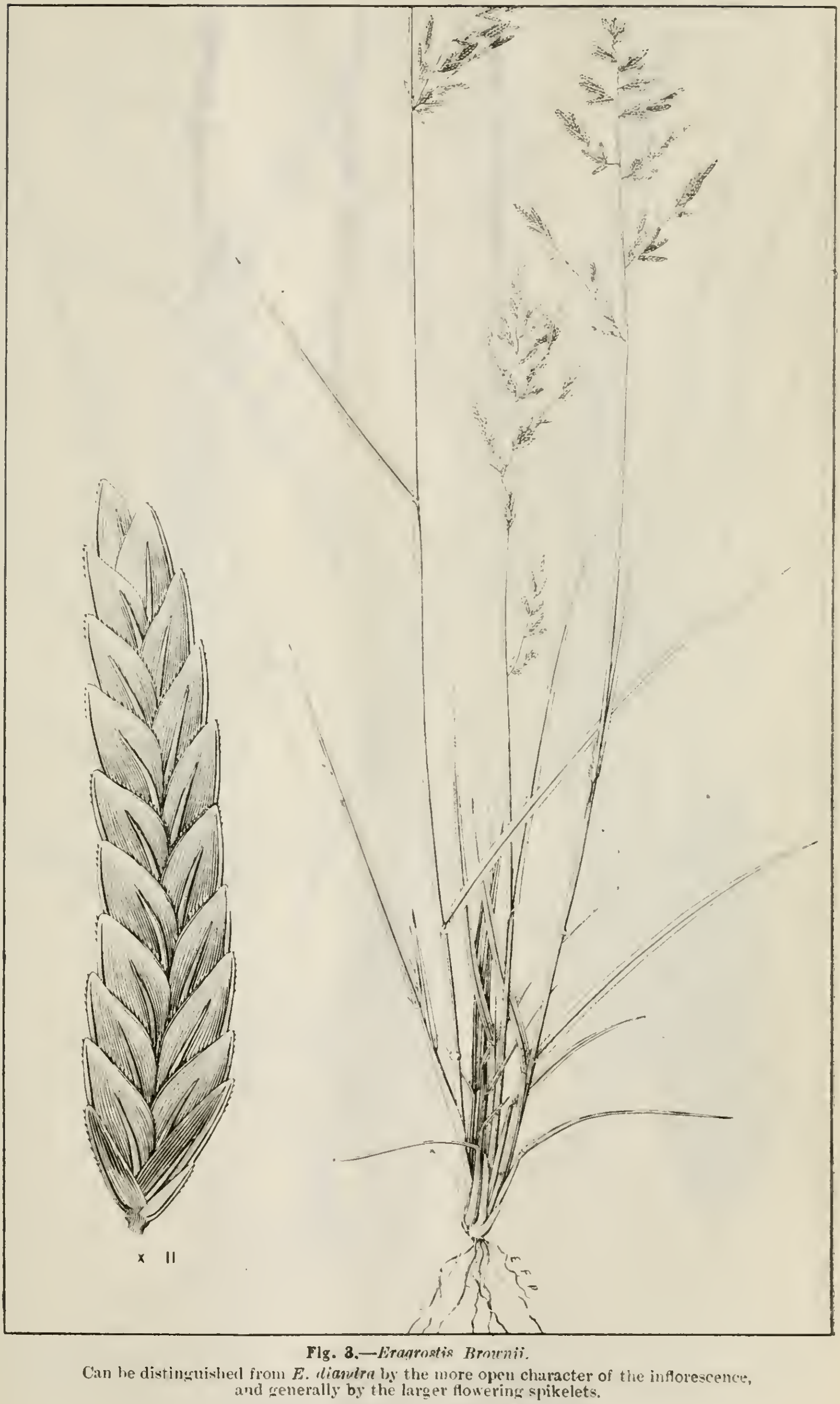

Fig. 3.—*Eragrostis Brownii.*
Can be distinguished from *E. diandra* by the more open character of the inflorescence, and generally by the larger flowering spikelets.

Popular Descriptions of Grasses.

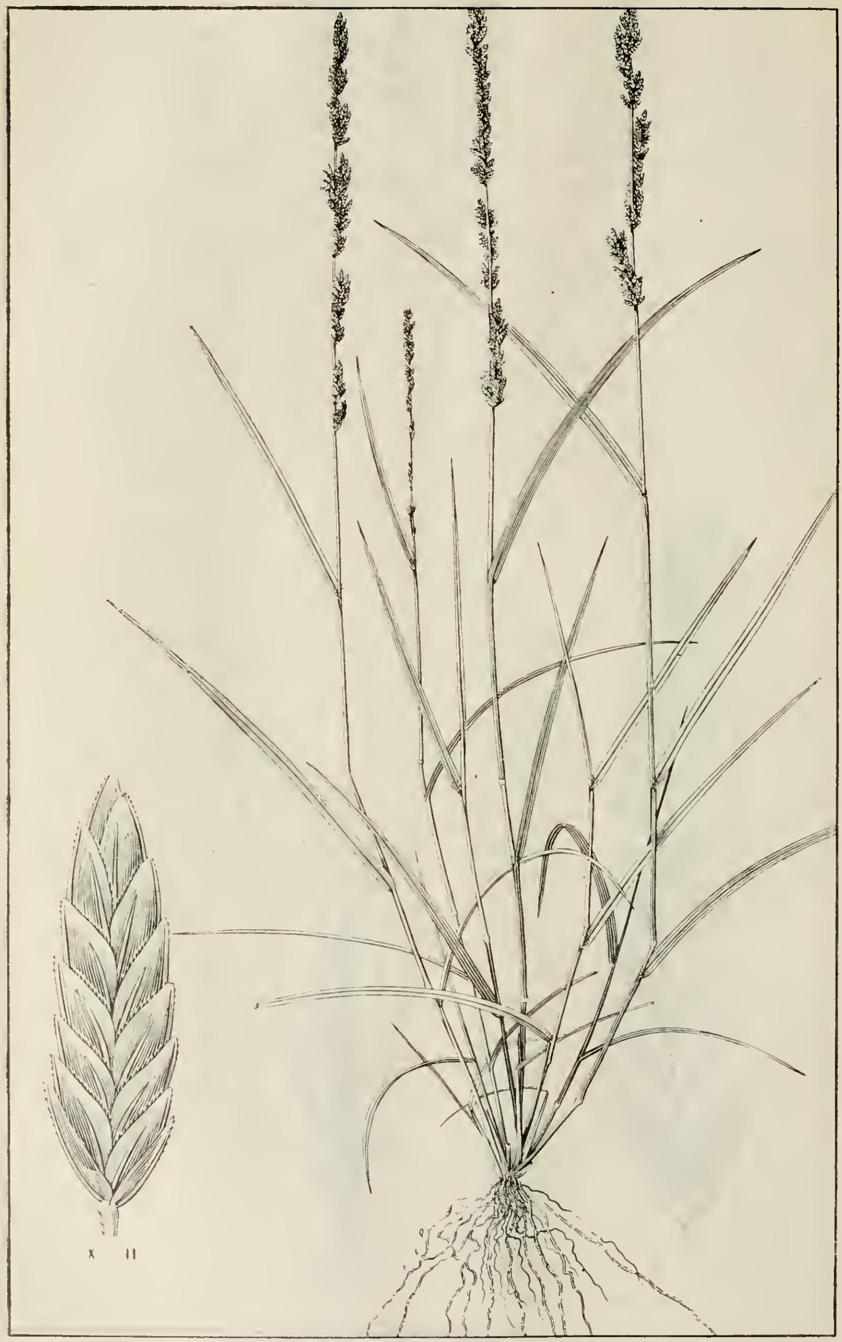

Fig. 4.—*Eragrostis diandra.*

Can be distinguished from *E. Brownii* by the more clustered, and generally smaller, flowering spikelets.

POPULAR DESCRIPTIONS OF GRASSES.

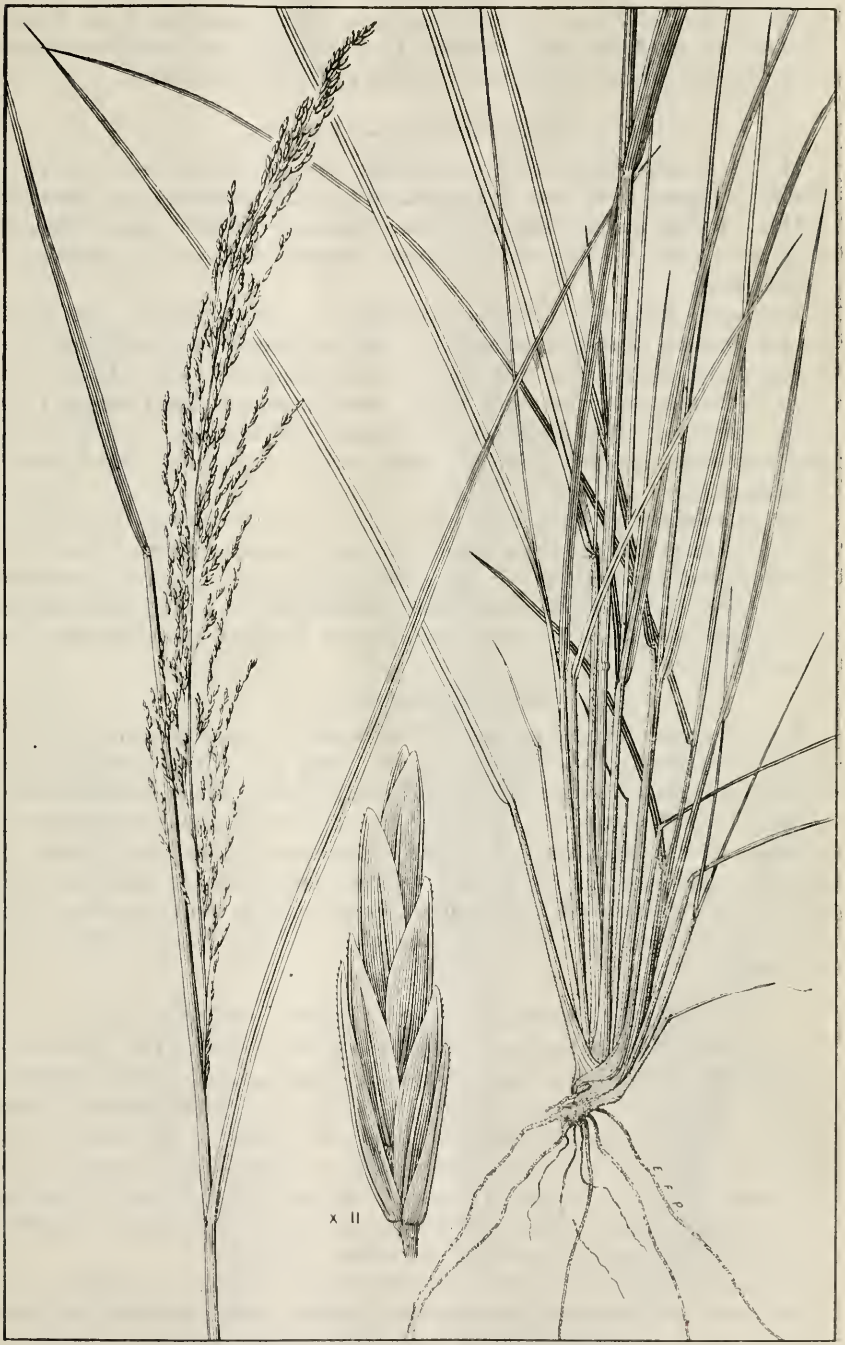

Fig. 5.—*Eragrostis curvula* **(introduced).**

Note the tufted hairy root-stock—probably a drought-resistant characteristic.

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point of view, which are highly satisfactory. The paddocks of the Upper Hunter are noted for their Paddock Love grass, and in that district the milk tests are generally high and the butter of first-class quality.

Eragrostis Brownii (Fig. 3).

This is a grass closely akin to Paddock Love grass, but as a rule it is found on better soils, and it is probably a more palatable and valuable fodder. It has much wider and flatter flowering spikelets than Paddock Love grass, and the longitudinal furrow between the rows of spikelets is very distinct.

Eragrostis Brownii is much more abundant on the tablelands and slopes than *Eragrostis leptostachya,* and it is on the better class of soils, such as volcanic and alluvial soils, that it reaches its best development. It does not grow in association with couch to the same extent as does Paddock Love grass, but it will often dominate other grasses and herbage in moist places. The indications are that it is much more partial to moisture than Paddock Love grass.

Its palatability is of a high order. As a rule its foliage has a finer texture than Paddock Love grass. In the spring months it provides excellent feed for the stock, but it begins to go off as soon as the hot weather approaches. It revives, however, with the smallest amount of rain, and in an ordinary season on the coast provides good feed practically all the year round.

Eragrostis diandra (Fig. 4).

Typical grasses of this species will be found in abundance on the sandstone formations of the Hunter River. They are characterised by the clustering arrangement of the seed spikelets, which. in their immature state, assume a purplish tinge. The grass is a fine stooler, and, although not growing as tall as Paddock Love grass, produces a good basal growth of succulent leaves, which dairy stock greatly appreciate. It does not seem to hold its own too well with Paddock Love grass in the Cumberland and Illawarra districts, but it is fairly abundant on all sandstone soils north of Sydney.

Eragrostis curvula AND *E. curvula*, VAR. *valida* (Fig. 5).

The latter is really an improved form of the former. This grass was introduced from America some years ago, and grown at the different experiment farms. It soon asserted itself as a very rapid grower, a free seeder, extremely drought-resistant, but with leaves of a rather harsh character. The leaves are extremely long, tapering very gradually to a fine point. During a dry spell the ends of the leaf wilt and curl up, leaving the rest quite green. The inflorescence is always of a distinct leaden colour, with the spikelets crowded and rather pointed.

Eragrostis curvula does extremely well under cultivation, and has produced yields at Hawkesbury Agricultural College as high as 6 tons of green feed per acre. Owing to its drought resistance it was taken up by different farmers, and although it has been reported on favourably, both for drought

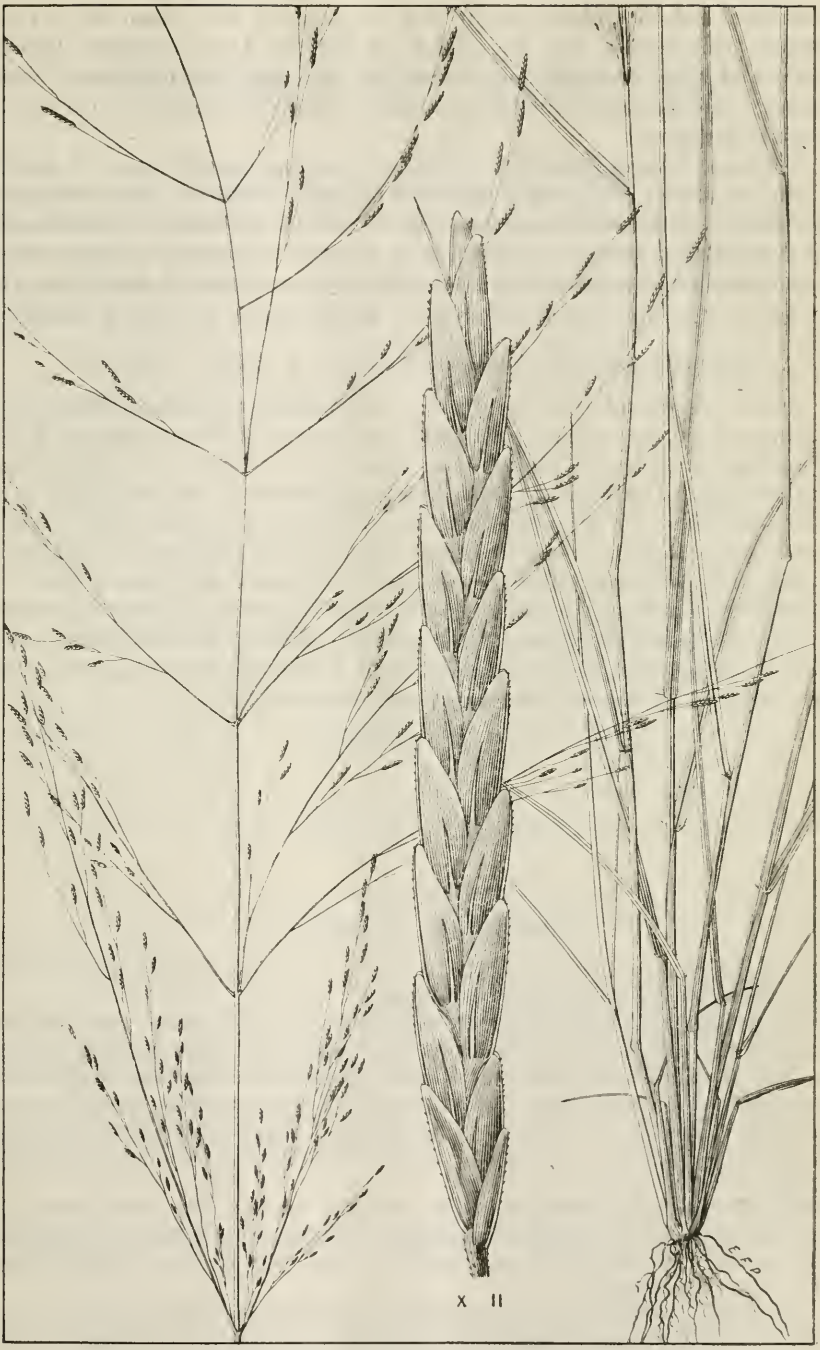

Fig. 6—Weeping Love Grass (*Eragrostis pellucida*).
Note the delicate slender appearance of the inflorescence.

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resistance and for palatability, it does not seem to have taken on to any extent. One farmer, viz., Mr. Giblin, of Taylor's Arm, Nambucca River, has found it an extremely useful grass for spreading over hillsides of poor country, and he and his neighbours testify that cattle eat it very readily when it is young.

Although *Eragrostis curvula* is looked on as a permanent grass, it seems to die out after a few years if subjected to hard conditions. New seedlings, however, are constantly appearing, and it could undoubtedly be maintained in a permanent pasture by allowing it to seed. Generally speaking, this grass may be recommended for scattering over burnt ashes in scrub country of poor formation, when it will act as a good stand-by in times of drought.

Eragrostis pellucida (formerly known as *E. pilosa*). (Fig. 6.)

This is an annual grass occurring in odd patches all over the State, but commonest in the interior, such as the red soil or black soil plains. It is sometimes known as Weeping Love grass, on account of its drooping inflorescence. Unlike most of the Eragrostis species of the interior, it is a succulent grass of a rather spindly character. It occurs only under favourable conditions, and in dry seasons it soon disappears. Although appreciated by stock, owing to its short-lived habit and sensitiveness to periods of drought it cannot be said to rank in importance with the Everlasting or Never-fail grasses of the interior. Helped by ideal spring conditions, it has been very abundant inland during the 1917-18 season, and has provided an unusual amount of succulent feed.

(To be continued.)

COTTON IN AUSTRALIA.

In the *Gazette* for October, 1917, I brought forward some historical notes, and the following will supplement them:—

In the *Sydney Gazette* of 27th November and 2nd December, 1830, will be found some interesting "Documents relating to the cultivation of Cotton in New South Wales" (published under authority of the Governor). Mr. John Maclaren, of Sydney, under date 4th November, 1829, sends invoice and bill of lading to his agent in Liverpool, England, "for three bales of New South Wales Cotton Wool, the first exportation from hence of that article."

The net proceeds of the three bales were £16 15s. 3d. The correspondence, giving particulars of American methods of cultivation and other particulars, fills several columns. It is not stated in what part of New South Wales the cotton was grown.

A leading article in the same journal, 27th November, 1830, refers to the efforts of Mr. Fraser, of the Botanic Gardens, in promoting the growth of cotton.—J. H. MAIDEN.

Experiments with Sudan Grass.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

DURING the past year, trials with Sudan grass have been conducted by private farmers, on Farmers' Experiment Plots under the supervision of Inspectors of Agriculture, and at Departmental Experiment Farms. Summarising the reports on these trials, it will be found that :—

1. During last season Sudan grass did remarkably well on the coast and slopes of the interior as far west as Nyngan. It does not thrive, however, in cold districts such as Braidwood

2. Farmers and experimentalists all testify as to its succulence and palatability.

3. Sudan grass is characterised by a remarkable rapidity of growth, only eight weeks intervening between each cutting.

4. The grass will stand periods of dry weather, and also heavy rains. The season at Casino was phenomenally wet, yet a heavy crop was obtained; and at Yanco the grass was not affected by a week's inundation of water.

5. It seems advisable to sow fairly early in the spring. By this means the grass is well established by midsummer and better able to stand adverse conditions in January and February. On the other hand, by sowing late (December) the grass cannot stand adverse conditions in January or February, and is likely to prove a failure. In the North-West, West, and North Coast, sowing in September is recommended, and elsewhere in October.

6. It appears advisable to cultivate the grass during its growing period. This can only be done by sowing in drills sufficiently wide apart to allow for such cultivation.

7. The use of fertilisers has again been proved to be very beneficial. An application of 1 to 2 cwt. of superphosphate is recommended. (See also the experiments of Mr. S. Hinder, of Tallawang, referred to in the report of the Tallawang Branch of the Agricultural Bureau, later in this issue.)

The action of the fertilisers is most evident in the first crop, and its effect disappears towards the end of the season.

8. Grazing the first crop appears to encourage the stooling properties of the grass, and, if rested at intervals, it will carry a fair amount of stock during the summer. At Yanco Experiment Farm one acre would have carried three cows for forty-two periods of four hours each.

9. If fed in conjunction with a crop like lucerne, the grass is likely to increase the milk yield from 25 to 30 per cent. than if fed on lucerne alone.

10. Sudan grass has again been recommended (*a*) for hay, (*b*) for soiling, and (*c*) as a feeding-off crop during the summer months.

Farmers' Private Trials.

Farmers, to whom seed of Sudan grass was distributed last season for trial, have reported as follows :—

Mr. J. Pirie, Wallinga Farm, Mudgee.—I sowed the seed on some winter fallow land of poor quality, and it turned out very well. I let it grow right on, and cut it for seed purposes. I have not threshed it yet, but the seed is of very good quality. Since the seed was taken off I have had a few sheep grazing on the plot, and it is still standing up to a feed-off at times. The sheep seem to do well on it while it is kept short. I intend putting down a larger area next season.

Mr. W. J. Anderson, Gloucester.—The seed was sown in rows about 3 feet apart, on rich loamy soil, on 29th December. The season was very wet. The grass came up well, and grew rapidly to a height of 7½ feet. After coming out in head it became affected with the blight, which was rather common in this district. I kept a portion of the seed and planted it in the open field. I was well pleased with the grass, and, all being well, will plant it on a larger scale.

Mr. M. McGrath, Wagga.—I sowed 8 acres with a wheat drill, and by closing every alternate hole I managed to sow it at the rate of 8 lb. per acre. I drilled it a few days before Christmas, and put six horses, five cows, and forty pigs in on 1st February, 1918, and took them out on 20th February. The crop is now 5 or 6 feet high, and seeding well. I intend to harvest it for seed when ripe. I may state that all the stock ate it greedily, and did very well on it. It is growing without irrigation on high, red gum country, which is new land.

Mr. E. F. Field, Ungarie.—The grass came up, and grew about 5 feet high, but owing to large numbers of parrots and sparrows here, I was unable to save any seed. I fed it down with sheep and cattle, but they don't seem to like it quite as well as the millet; but I think it would be a valuable grass to conserve for drought.

Mr. S. H. Robinson, Tallawang.—The Sudan grass yielded 4 tons 1 cwt. 3 qrs. 16 lb. of hay per acre.

Mr. J. Franks, Parkes.—I think the grass will yield about 1 ton of hay for a quarter of an acre.

Mr. J. Hynder, Braidwood.—I planted the seed on 1st November, in drills 4 feet apart in good sandy loam and virgin soil. It grew 9 inches by 15th March, when it was eaten off. Very little second growth was made, and an early frost killed it off. It is not satisfactory here.

Mr. W. J. Thrift, Quirindi.—I got the seed in about the end of December after good rain, and in fairly black soil, but it got scarcely any rain after planting, and though it got a good start it withered off when about 6 inches high. I am sure it would do well if it were given a fair chance. I should have got it in earlier. A neighbour of mine had some in about November, I think, and it did very well, growing about 5 feet in places. I intend giving it another trial this year, if I can procure the seed.

Mr. A. J. C. Vogele, Martin's Creek.—I sowed it after Christmas in a very well-prepared plot of land, but rather poor soil. The seed germinated well, and for some time past we have been gathering seed for resowing next year. It grew about 7 feet high.

Farmers' Experiment Plots.

Plots of this grass were planted in Farmers' Experiment plots at Casino and Upper Taylor's Arm, Nambucca River, and reports have been received as follows :—

Mr. C. Oliver, Casino.—Considering the very wet season, the Sudan grass did very well. I cut the first crop for hay. It was a heavy crop, and I was quite proud of it. The second crop was grazed with cows.

Mr. J. Giblin, Upper Taylor's Arm.—The Sudan grass gave splendid results. It grew from 5 to 7 feet high, according to the quality of the ground. The plot was well laid out, running through three sorts of soil—first gravelly, sandy loam, second deep loam, and third chocolate dark soil. That on the deep loam grew the best, being fully 3 feet higher than either of the other soils, on which it grew about the same height. The cows ate it very greedily when turned on it. They left no stubble, but nipped it to the ground. In a few weeks it was almost the same height again. I am very pleased with the results.

Manurial Trial at Yanco Experiment Farm.

Mr. J. M. Pitt, Experimentalist, reports as follows :—So many trials have been conducted by the Department with this valuable fodder plant already, and such excellent results have been obtained, that any further improvement in yield would seem improbable. However, from results published, none have as yet been noticed exceeding the yields taken from the manurial trial just concluded at the Farm.

Although sowing did not take place until 5th November, 1917,—the lateness being due to the cold and wet wintry weather conditions delaying ploughing operations—three cuttings were easily obtainable, and there is no hesitation in saying that in an ordinary season, when sowing could be carried out a month or six weeks earlier, four cuttings should not be out of the way.

A plot of fairly stiff shallow soil was selected for the experiment, which was sown as follows :—

Nos. 1, 4, 7 (*checks*)—No manure.
Nos. 2 and 5—1 cwt. superphosphate per acre.
Nos. 3 and 6—2 ,, ,, ,,

Seed at the rate of 5 lb. per acre was sown in drills, 3 feet apart, with a small hand drill, and the necessary quantities of manure applied by hand in the respective plots.

TABLE I.—Manurial Trials of Sudan Grass, Yanco Experiment Farm, 1917–1918.

Plot No.	Superphosphate per acre.	First Cutting, 18th Jan., 1918.	Second Cutting, 1st March, 1918.	Third Cutting, 4th June, 1918.	Total Weight per Plot.	Weight per acre.		Percentage.
		lb.	lb.	lb.	lb.	t.	c.	
1 (*check*) ...	Nil ...	200	652	588	1,440	9	19	100·0
2 ..	1 cwt. ...	393	697	533	1,623	11	4	111·6
3 ...	2 ,, ...	535	818	498	1,851	12	16	126·1
4 (*check*) ...	Nil ...	254	771	456	1,481	10	4	100·0
5 ..	1 cwt. ...	410	903	487	1,800	12	12	114·0
6 ...	2 ,, ...	469	855	533	1,857	12	17	110·7
7 (*check*) ..	Nil ..	378	793	603	1,774	12	5	100 0

A fortnight after germination a big difference was noticeable between the three different sections, the manured plots easily showing to the best advantage, which continued throughout the first growth.

The unmanured plots averaged	10 tons	16 cwt.	per acre.
,, 1 cwt. superphosphate plots averaged	11 ,,	18 ,,	,,
,, 2 cwt. ,, ,, ,,	12 ,,	17 ,,	..

The crops were cut with the maize harvester, and the green sheaves were readily eaten by the milking cows.

From the figures quoted in Table I it will be seen that in the first cutting superphosphate was responsible for a very marked increase in yield, especially with the 2 cwt. application. (It might be mentioned that a small sour patch in Plot 6 produced weak growth, which was the cause of the yield in this plot being so close to that of the 1 cwt. plot, as compared with plots 2 and 3.) This increase was not due so much to the extra height to which these particular plots grew, but to the greater stooling, this being very noticeable after the crop was removed.

The extra stooling encouraged by cutting was more pronounced in the unmanured than in the manured plots, and, in fact, from outward appearances the manured plots looked very little superior. Very little difference was seen in the third cutting, all plots being about equal, although the unmanured did not show the falling off the manured plots did.

In the following table the marked increase in yield of the second and third cutting over the first in the unmanured is seen in comparison with the manured.

Plot No.	Superphosphate per acre.	Plot Yield per cutting.			Increase of second over first cutting.	Increase of third over first cutting.
		1st.	2nd.	3rd.		
		lb.	lb.	lb.	lb.	lb.
1 (*check*) ...	Nil ...	200	652	588	452	388
2 ...	1 cwt. ...	393	697	533	304	140
3 ...	2 ,, ...	535	818	498	283	(—) 37
4 (*check*) ..	Nil ...	254	771	456	517	202
5 ...	1 cwt. ...	410	903	487	493	77
6 ...	2 ,, ...	469	855	533	386	64
7 (*check*) ...	Nil ...	378	793	603	415	225

(—) Signifies decrease.

For no cutting did the height reach above 6 feet, but the plants carried an unusually large amount of dark green succulent flag, thus accounting for the good yields.

To show with what rapidity Sudan grass grows, the following figures are quoted :—

From germinating date to first cutting ...	9 weeks ...	5½ feet.
From first cutting to second cutting ...	6 ,, ...	6 ,,
From second cutting to third cutting ...	14 ,, ...	5 ,,

At one period after the first cutting, it grew 2½ feet in less than ten days, literally climbing up the measuring stick kept in the bed. Although fourteen weeks is given as the interval between the second and third cuttings, the maximum growth was really reached in ten weeks, the remainder of the time being allowed for the seed to ripen, which it failed to do owing to a severe frost at the end of May.

Besides the natural rainfall over the growing period, viz. :—November, 1917, 310 points; December, 180; January, 1918, 318; February, 248; March, 61; April, 137; May, 186 points—five irrigations were given, viz., on 5th, 23rd, and 30th January, 9th February, and 5th April. And to show that Sudan grass, when well established, does not mind "wet feet," it might be mentioned that some of the plants were inundated for over a week without detrimental effect.

In conclusion, it may be stated that the application of superphosphate, even up to 2 cwt. per acre, has been justified, and should be very beneficial in districts where the seasons are short.

With such a thin seeding there was an entire absence of coarseness, the proportion of flag to stalk being very large.

It is remarkable that with such a fodder plant before them, settlers on the Area, especially those interested in dairying, do not go in for its cultivation. Only in one or two instances can it be recalled where small samples of seed have been applied for. It certainly cannot be because of the difficulty in cultivation, for Sudan grass is one of the easiest seeds to germinate. Not only does it supply one of the best succulent fodders, but it is available before any other crop, and can be fed-off without any detrimental effects to itself or to stock quite readily. Besides, it has been proved a great drought-resister.

Grazing Trial at Yanco Experiment Farm.

A grazing trial to determine the exact carrying capacity of the grass during its growing season, and to estimate the quality of the grass from a milk-producing point of view, was also carried out, but with results not quite as satisfactory as the manurial trial.

Great difficulty was experienced in getting the land into a fit state to sow, owing to large areas of rain-water lying in the furrows. The experiment, therefore, could not be sown until 5th December, thus losing some of its value from an "exact carrying capacity point of view." Owing to the rush of other work at that time, the seed was sown with the wheat drill, every second hole being blocked. This method is not to be recommended; the maximum amount of stooling and growth is obtained only when the seed can be sown in drills at least 3 feet apart, and a cultivation given after irrigation or rain.

The area comprised 4 acres, and 15 lb. of seed and 60 lb. superphosphate were sown per acre. Germination was not good, an acre near the sugar-gums and a few ridges failing altogether. About 3 acres were, therefore, available for grazing. Warm weather and showers soon forced the young plants along, and the first feeding off took place on 25th January, and was continued as follows. Eighteen cows were used.

Date.	Period grazing hours.	Date.	Period grazing hours.
25th January ...	5	30th January ...	4
26th ,, ...	6	31st ,, ...	5
27th ,, ...	6	1st February ...	4
28th ,, ...	6	2nd ,, ...	4
29th ,, ...	4	3rd ,, ...	4

The total was forty-eight hours, after which the paddock was irrigated and closed for further growth.

Good stooling, encouraged by the grazing, took place, and the paddock soon had a green appearance. The second growth, which was much thicker than the first, was grazed as follows. In this case fifteen cows were used:

Date.		Period grazing hours.	Date.		Period grazing hours.
18th March	...	2	23rd March	...	6
19th ,,	...	6	24th ,,	...	4
20th ,,	...	6	25th ,,	...	6
21st ,,	...	4	26th ,,	...	5
22nd ,,	...	3	27th ,,	...	3

or a total of forty-five hours.

At night, and when not feeding, the cows were running in a dry pasture paddock, sparsely covered with Paspalum and Danthonia grasses, and were given lucerne hay. The average period during which the cows were grazing on the Sudan pasture was between four and five hours per day.

Worked out on this basis, from the figures quoted, viz., eighteen cows on 3 acres for forty-eight hours, this would be equivalent to about six cows per acre for twelve periods of four hours each for the January crop, and six cows for 1⅓ acres for eleven periods of four hours each for the March grazing.

It is not advisable to graze for too long in midsummer, owing to the plants requiring watering; in fact, after ten days, any stubble remaining should be mown off and the plot watered.

Besides the above, the cows were allowed to have a few days grazing in May, but the growth was very sparse.

It was noticed that although the milk yield increased a little when fed on Sudan grass alone in comparison with green lucerne alone, when fed together there was a marked increase in yield. Weighings were not kept, but it is safe to say the milk yield increased 25 to 30 per cent.

Women's Training Farm, Cowra.

Mr. W. K. Goodsir, Assistant Experimentalist, reports :—During this season the fourth trial with Sudan grass in this district was made. The season was exceptionally cool and moist; the soil was of granite origin, deep and loamy.

Disc ploughing was carried out 22nd October, and the soil was then carefully harrowed. Owing to heavy rain on the day previous to sowing there was a fine, moist seed-bed.

The rainfall was as follows :—October, 1917, 399 points; November, 281; December, 172; January, 1918, 311; February, 201. Of the above, 10 inches 28 points were recorded during the growing period. Sowing took place on 25th October, 15 lb. of seed being broadcasted per acre.

On the whole the germination was fairly good, and the growth following was rapid. It seems a grass that will stand dry weather, and also one that will respond well in a warm, moist climate.

The flag was very succulent, and looked palatable for stock. On 7th January it was well out in flower, being some 5½ feet high, and a second growth was appearing from the base of the stems. On 1st February the first ears were peeping.

Harvesting was carried out by means of the reaper and binder on 14th February, and threshing was done 27th February.

The yield from this ·948 acre was 352 lb. pure seed.

A very succulent second growth was fed-off to the cows, and the average height on 25th March was 3 to 3½ feet.

The grass appears to suit this district very well, as (*a*) a hay grass, (*b*) soiling crop, (*c*) for seed. It is very hardy, and stands dry weather well. The actual yield of seed from one acre was 371 lb.

Nyngan Demonstration Farm.

Mr. H. J. Kelly, Manager, reports :—As a rotation crop with wheat 16 acres were planted with Sudan grass in paddock No. 1A, on 15th, 16th and 17th October, 1917, at the rate of 3 lb. per acre, the drills being spaced at 28 inches apart to allow for intertilling during growth.

On 26th October the young plants were above ground, and the season being favourable to growth, they made good headway, attaining a height of 5 feet by the middle of December, when they came into flower.

The first cutting for hay was made on 21st and 22nd December, and yielded about 1 ton per acre, but this weight is only an estimate, and the exact weight will be ascertained and recorded when the hay is chaffed.

The second crop made patchy growth, and was allowed to ripen for grain, but owing to dry weather when maturing the grain yield will be very light, almost a failure. The second crop was cut on 14th March, 1918.

Two plots of ½ acre each were planted in the grass garden on 17th October, 1917, at 3 and 4 lb. per acre respectively, to ascertain if the difference in seeding would influence the yield; but portions of each plot being flooded for some time after germination, they were too patchy for comparison, and selected seed was gathered from them. This is good seed, and will be suitable for planting trial plots next season.

Wagga Experiment Farm.

Mr. W. Moyes, Experimentalist, reports :—A 4-acre block of grass was sown on 11th October, 1917. The mixture consisted of Sudan grass, Rhodes grass, and Sand Lucerne, sown at the rate of 3 lb., 5 lb., and 1½ lb. respectively. The germination of the Sudan grass was excellent, that of Rhodes grass was good, while Sand Lucerne was fair. The rapid growth of the Sudan grass was phenomenal, and it was over 5 feet high in December. It acted as a good nurse crop for the other grasses. The block was fed-off with cows. The second growth has been allowed to seed for next year, as the Agrostologist proposes to make a permanent grass block of it.

A block of Sudan grass alone was sown in the grass seed reserve and selected plants harvested for seed. A good crop of seed resulted.

Grafton Experiment Farm.

Mr. E. Golledge, Experimentalist, reports :—In connection with the area sown with Sudan grass at this Farm, for the purposes of plant and seed selection, a ¼-acre plot was sown in paddock 8 on alluvial soil, and a similar plot was sown on what is known as the " poor land." Sowing in both cases was done early in October. The growth of the Sudan grass in paddock 8 was exceptionally good, and by the middle of January, when flowering was completed, the average height was 8 feet. At this stage the plot was cut and the green weight calculated. The second growth was reserved to mature seed for plant selection.

A good deal of variation was noticeable, some of the plants showing pronounced sorghum characteristics.

The second growth is now in the flowering stage and averages 5 feet in height. With seasonable weather a fair seed sample should be harvested, but the first crop would have been better for the purpose.

The plot at the " poor land " carried a light crop of seed.

Hawkesbury Agricultural College.

Mr. W. M. Dill Macky, Acting Experimentalist, reports :—An area of ¾ acre was sown on 28th September, 1917, for the purpose of plant and seed selection. The soil had previously been under grain sorghums. It was ploughed, after the sorghums were harvested, on the 26th June, 1917, harrowed on 27th July, and again on 7th August, and finally ploughed, rolled, and harrowed on 26th and 27th September, 1917, and the seed then sown.

The quantity of seed sown was 2 lb. 14 oz., manured at the rate of 85 lb. to the block (59 lb. superphosphate and 26 lb. dried blood). Both the seed and manure were sown through the maize dropper, using sorghum plates.

Germination was satisfactory, and the crop received its first cultivation on 1st November, 1917, and subsequently on 26th December. Further cultivations were prevented during almost the entire remaining period of its growth, owing to the prevailing wet weather and soil conditions.

At maturity the crop (first cut) stood from 6 to 7 feet high, yielding an abundance of grain. Had the crop been cut for green feed the yield would also have been a heavy one.

The crop stooled well and displayed great hardiness in resisting adverse weather conditions; and heavy continuous rains had apparently no very marked influence upon it.

The grain obtained amounted to 470 lb., which is equivalent to 625 lb. per acre.

Coonamble Experiment Farm.

The Manager, Mr. W. R. Colwell, reports that an area of 4 acres was sown last summer under irrigation on black-plain soil, which had originally been prepared for lucerne, but owing to the dry summer it had been considered inadvisable to sow. The land was ploughed twice, disced once, and once spring-tooth cultivated. The seed was drilled in at the rate of 2 lb. per acre on 3rd January, and the ground watered on the 5th and 6th January. Germination was good and a rapid growth followed.

Sheep were turned in about six weeks later, and after being eaten down the crop was again watered. Another good growth resulted, the grass going to 3 and 4 feet high. This was again grazed, and the sheep did well on the succulent feed supplied.

Another growth was coming on rapidly, but being then somewhat late in the season it frosted off.

Three hundred sheep were carried for four weeks on the 4 acres of Sudan grass and 6 acres of Japanese millet.

For sheep he prefers Sudan grass to sorghums and maize, which are too stalky, and to millets. All were tested last summer.

It should be sown in the Coonamble district in early spring, and will stand any amount of water to germinate (this has been the experience at Yanco also). The seed comes through quickly, and will then go straight away. The heavy watering given at first will keep the plants growing for some weeks, and they will also hold green and succulent if not watered for at least two months. The denseness of the foliage hides the sun from the surface of the soil, thus preventing evaporation. Sown in rotation green feed would always be available, as by sowing early three good growths may be obtained.

INSTRUCTION IN POULTRY FARMING.

THE attention of the Minister of Agriculture has been drawn to the extensive use, without acknowledgment, by a School of Poultry Culture operating in this State, of the writings and recommendations of the Poultry Expert of the Department of Agriculture.

Apparently the work of the "school" is confined to the issue of a series of twenty so-called lessons in pamphlet or book form, much of which is copied, word for word (without any mention of its source), from the published works of the Departmental Poultry Expert, while the remainder includes many recommendations and suggestions which are considered quite unsuited to New South Wales conditions.

While the Department of Agriculture gives every encouragement to the wide dissemination of the Poultry Expert's advice, provided that it is suitably acknowledged, there are strong objections to its use under such circumstances, especially considering the charge made.

In order to attract as many purchasers of the course as possible, extravagant and quite unwarranted profits are claimed for the industry, which in the majority of cases cannot be realised, and can only result in disappointment and economic loss.

The Departmental officers are always willing to afford any desired information on the subject. In addition, useful publications are available, either free or at a nominal cost.

The Apple-leaf Jassid

(*Empoasca australis*).

W. W. FROGGATT, F.L.S., Government Entomologist.

This leaf-infesting jassid has been known for some years in the apple orchards in the southern districts about Yass and Binalong in a minor degree, but during last season it swarmed so thickly over the foliage of the Five Crown apples that all the leaves became variegated with yellow spots, produced by their countless beaks sucking up the sap, so that the growers were alarmed and wanted to know where the damage would stop. The writer paid a visit to Binalong in the middle of April last, and, going through a number of orchards, found nearly every tree sheltering thousands of these active, pale-green hoppers. On the lower levels, where the ground was damp, and the foliage was most luxuriant, they were most abundant, and both the stems and the under-surface of every leaf were covered.

In many cases the basal portions of the apples were discoloured through the exudations and excrement deposited by the resting jassids.

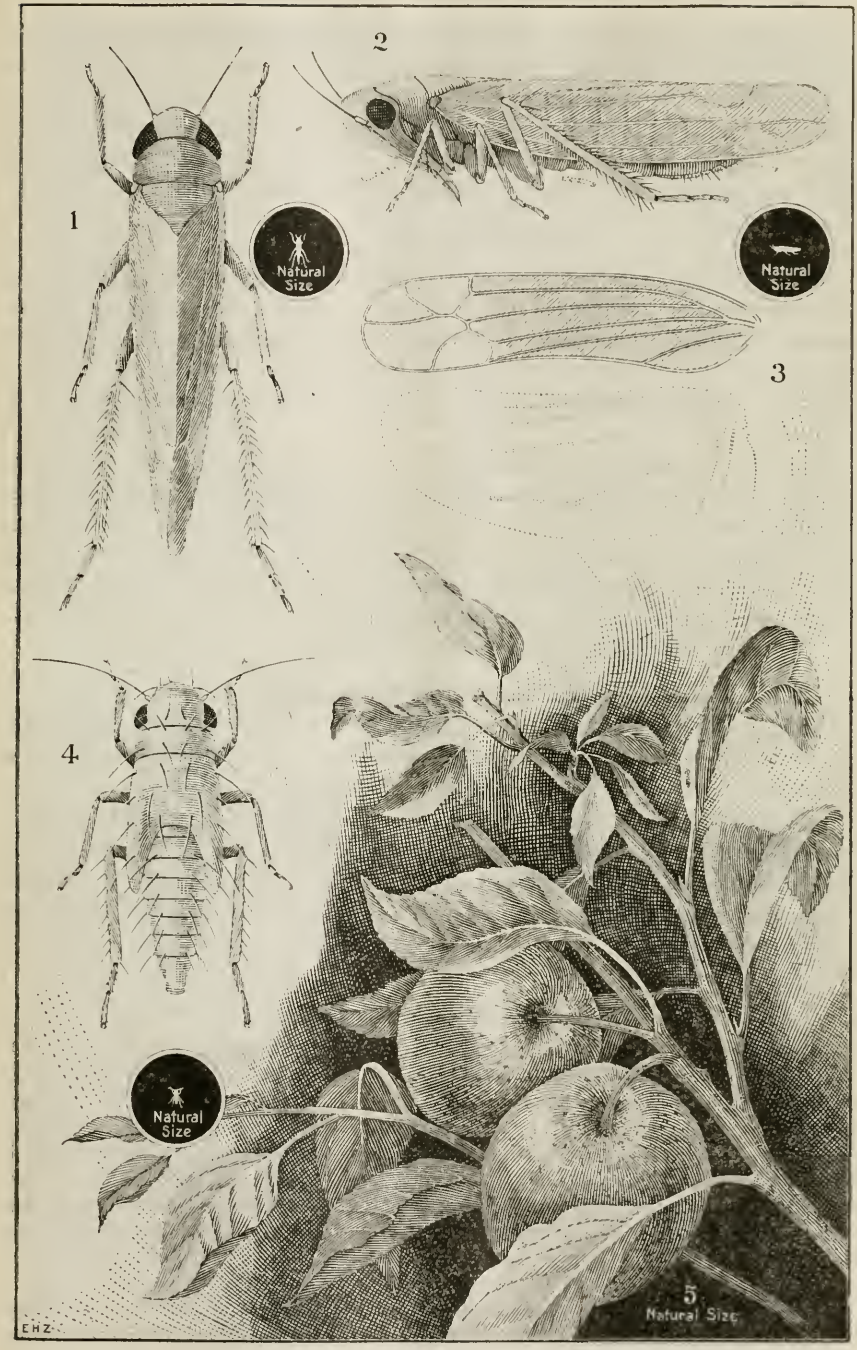
The actual damage to the apple crop caused by these insects at present is not very serious; but if the insects were to appear early in the season they might cause all the foliage to fall, and so spoil all the apples. Therefore this is a pest that is well worth the close attention of orchardists.

This family of the Homoptera (*Jassidæ*) is well represented in Australia by many interesting species of leaf-hoppers, most of which are found on the native shrubs and plants; and some years ago it was suggested that the yellow spotting ("leaf rust") of the maize was caused by one of these leaf hoppers. This, however, is rather doubtful, and few species have been recorded as enemies of cultivated plants or shrubs in Australia. Several have been found in the United States doing a great deal of damage, such as the "sugar-beet" Leaf Hopper (*Eutettix tenella*). This is such a serious pest in California that the Horticultural Commissioners of California sent out a special investigator to try and collect the parasites of allied Australian forms and ship them to America in the hope that they might introduce and establish them in the sugar-beet fields in California.

Another species, the Rose-leaf Hopper (*Empoasca rosæ*), does a considerable amount of damage to the foliage of rose bushes; while a third species of the genus (*Empoasca mali*) is a common apple-tree pest over a large area of the Western States of North America. This one infests the outer margins of the leaves, and causes them to curl up along the sides.

Empoasca australis, n.sp.

The species under consideration appears to be closely related to, if not identical with, *E. mali*, but it does not quite agree in coloration, and does not cause the leaves of the apple trees to curl up in the same manner through



The Apple-leaf Jassid (*Empoasca australis*).
1. Dorsal view. 2. Side view. 3. Wings. 4. Larval form.
5 Fruit and foliage of apple tree spotted by the action of the apple jassids.

infestation. As we have no native trees allied to the cultivated apple, and this species appears to confine its attention to orchard trees, it is quite possible that it is an introduced species that has bred up to the present state under suitable conditions. As the eggs of these frog-hoppers are deposited in the larger veins of the leaves and soft tissues of the petioles, it would be very easy for them to have been introduced in the State from California with nursery stock.

TECHNICAL DESCRIPTION.

General colour rich yellow, with a slight greenish tint, which latter fades out after death; the tips of the fore pair of wings (elytra) lightest; hind wings white, with rich opaline reflections in strong light; eyes deep reddish-brown; scutellum bearing two angular, reddish-brown blotches on the front margin; under surface and legs pale yellow. Length variable from 4 to 5 millimetres.

General form slender, tapering to the tip of the abdomen; wings folded closely down the sides of the body; the front of the head projecting beyond the eyes, rounded in front; the face turned downward, with the rostrum under the head reaching to the base of the second pair of legs; eyes large, with the apical portion of the antennæ produced into a long hair-like bristle. The legs long, well adapted for jumping; the tibiæ of the hind legs furnished on the under margins with two rows of stout spines.

Suggestions and Remedies for checking this Pest.

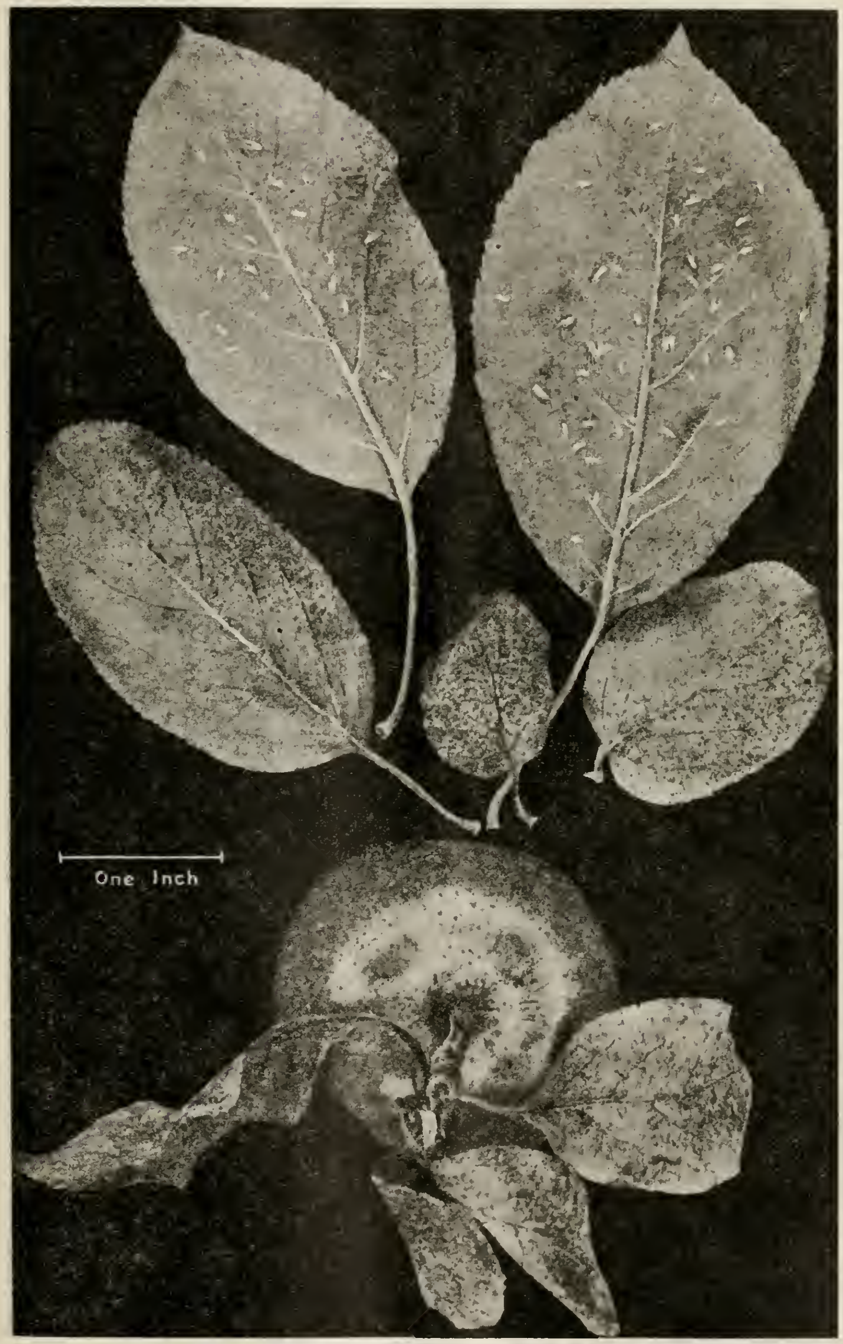
It would be well to clear up and dig into the soil all fallen leaves and weeds in which the eggs might be deposited, or where nymphs or adult insects were sheltering in all orchards where these frog-hoppers are present.

As the eggs are laid under the bark in the young wood, the best time to spray would be in the early summer, before the first broods have had time to develop, and deposit a fresh crop of eggs. Kerosene emulsion or tobacco and soap wash should be effective contact poisons to these insects in all stages of development.

THE DIVINING ROD.

THE Society of Natural Sciences of Wageningen, Holland, organised experiments in order to test the value of the divining rod. Four diviners took part in the tests, which consisted (1) of tracing underground streams and controlling their courses in a given plot; (2) of determining whether underground conduits were full of water or dry. The results showed (says the *International Review of the Science and Practice of Agriculture*) that in many cases it was probable, and in some cases it was certain, that the rod did react to some apparently existent conditions. This shows the apparent success of diviners to be due to superficial control and their observation and experience of the ground.

Completely unfavourable results were obtained in searching for predetermined water currents; correct answers were obtained in twenty-three cases, and wrong ones in twenty-five. The results of the experiments were therefore in opposition to the claims of the diviners.



Apple Foliage and Fruit showing infestation.

THE APPLE-LEAF JASSID.

Water on the Farm.

[Continued from page 386.]

F. B. GUTHRIE.

WATER FOR HUMAN CONSUMPTION—*continued.*

In discussing chemical substances used for the purification of water for drinking purposes, mention was made of chloride of lime or hypochlorite.

This substance is being used in the present war, apparently, by all the belligerents for purifying the soldiers' drinking water. It is put up in the form of compressed tablets containing 0·015 grammes of hypochlorite (3½ milligrammes of available chlorine) and 0·08 grammes of common salt. One tablet is used to every litre of water. The water is fit to drink in twenty minutes. It is found that injurious organisms are destroyed in ten to twelve minutes, even when much organic matter is present.

WATER FOR MISCELLANEOUS PURPOSES.

Wash-houses and Laundries.

For the preliminary soaking, and for the subsequent treatment with soap, soft water is indispensable for the best results. Hard water is to be avoided on account of the waste of soap, due to the formation of insoluble lime salts which do not lather, and have therefore no cleansing action. All the lime salts must first be neutralised by the soap before a lather can be produced. Water for laundry purposes should not contain more than 15 to 20 parts of carbonate or sulphate of lime per 100,000. It is no good if the lime salts exceed 30 parts per 100,000. For the final rinsing and blueing, hard water is less objectionable.

Speaking generally, the water should be soft (rain-water is the best). It should be as free as possible from organic matter and colour, and from iron salts. These impurities are liable to stain the fabrics or produce spots. Iron salts are especially objectionable, as they give rise to reddish-brown spots (iron-mould). Hard waters can be softened by any of the processes previously discussed, or by adding carbonate of soda to the water, the quantity to be added depending upon the hardness of the original water.

Wool-washing.

Hard water is objectionable in this case also, as it diminishes the permeability of the fibre, and reduces its power of subsequently taking dyes and mordants. The result is an uneven distribution of the colour. Muddy waters, containing clay or organic matter in suspension, are also to be avoided, as the suspended matter becomes deposited in the fibre, and is difficult to remove.

In scouring or de-greasing, soft water is essential, and water used for this purpose is usually rendered alkaline by caustic potash or soda. Caustic potash is preferable, as it does not attack the fibre to the same extent as caustic soda does.

Tanning Hides.

The preliminary de-hairing is usually done with lime and water. In this case also the water should be soft, as the carbonate of lime present in hard waters forms an insoluble deposit in the tissues, which renders the hide inflexible, and is very difficult to wash out. In addition to destroying the flexibility of the hide, the presence of this deposit retards the absorption of tannin.

Further, unless the lime used can be readily washed out, it itself combines with the tannin, forming a tannate of lime, which on exposure to the air darkens and imparts a brown stain to the leather. Sulphate of lime and sulphate of magnesia are, however, unobjectionable, and they are frequently added by the tanner.

Other substances which are objectionable are chlorides (common salt), greasy matter and iron salts. Iron salts form tannate of iron, which is the basis of ordinary writing-ink, and which colours the leather black.

Alum or water-glass (silicate of soda) can be used for removing the iron. When these substances are added to water containing salts of iron the iron forms a precipitate which settles on standing. For the preparation of tan liquors or extracts of dye-woods, such as log-wood, sumach, &c., the same remarks apply. Hard carbonated waters form insoluble tannins, which are wasteful of tannin, and iron turns the tannin dark green or blue (nearly black). The presence of organic matter in the water with which such extracts are made, is objectionable, as such water is liable to putrefy and ferment.

Soap-making.

In many households the waste fats and oils are converted into soap by boiling with lye (or soda).

In this case, also, the water in which the soda is dissolved must be soft (free from lime salts), as both lime and magnesia salts form insoluble compounds with the soap which reduce its cleansing action. The presence of chlorides and sulphates is also objectionable in the process of boiling fat and lye, though in the subsequent "salting out" these substances are unobjectionable.

Soft water is essential in making the lye; and in the case of the production of soap on a large scale, many manufacturers, who are obliged to use hard waters, find it economical to boil and condense the water. Water which contains organic matter or clay in suspension must always be subjected to a preliminary filtration, through a filter-bed composed of sand at the bottom, then fine gravel, and a top layer of coarse gravel.

Water for Dairy Purposes.

For dairy purposes, butter-washing, &c., the purest water obtainable is required, and in these cases particularly the purity depends less upon the amount of saline matter present than upon the freedom of the water from bacteria.

As a general proposition, water which is to be used in the churn or for washing butter, should conform approximately to the following requirements :—

Total solids	20 to 40 parts per 100,000.
Chlorine	1 to 2 ,, ,,
Free ammonia	below 0·001 parts per 100,000.
Albuminoid ammonia ...	below 0·01 ,, ,,
Nitrates	below 0·02 ,, ,,
Nitrites	nil (bad over 0·002 parts per 100,000).
Absorption of oxygen ...	below 0·1 parts per 100.000.

Water used in the Preparation of Substances used as Food or Beverages.

The same degree of purity as in the case of water employed in butter-making must be observed in the case of water which comes into contact with materials that are to be subsequently used as food. This applies to such household products as jams, beverages, &c.

It may be interesting to quote here the official French standards for water to be used in the manufacture of ice. These standards may be taken as representing a sound classification of water which is to be brought into contact with substances which are subsequently to be used for human consumption.

	Very pure Parts per 100,000.	Potable. Parts per 100,000.	Suspicious. Parts per 100,000.	Bad. Parts per 100,000.
Chlorine	below 1·5	below 4	5 to 10	over 10
Sulphates	0·2 to 0·5	0·5 to 3·0	over 3·0	over 5
Oxygen absorbed ..	below 0·1	below 0·2	0·3 to 0·4	over 0·4
Hardness	5 to 15	15 to 30	over 30	over 200
	In every cubic centimetre.			
Bacteria	0 to 50	50 to 500	500 to 3,000	over 3,000

Summing up—the water to be used for any purpose in which it comes in contact with substances to be used as food or beverages must be the purest obtainable, both chemically and bacteriologically.

LIST OF PLANTS DECLARED TO BE NOXIOUS IN VARIOUS SHIRES AND MUNICIPALITIES DURING JUNE, 1918.

Plant.		Municipality.	Shire.
Scientific Name.	Common Name.		
Echium plantagineum	Paterson's Curse ...	....	Boree. Demondrille.
Hypericum perforatum	St. John's Wort ...	....	Demondrille.
Inula graveolens	Stinkwort	Murrumburrah Yass.	Bogan. Boree. Demondrille. Murrungal.
Rubus fruticosus	Blackberry	Kogarah.	Tomki.
Rosa rubiginosa	Sweet Briar	....	Demondrille.
Sida rhombifolia	Paddy's Lucerne ...	Kogarah.	
Xanthium spinosum	Bathurst Burr ...	....	Demondrille.
Xanthium strumarium	Noogoora Burr ...	Aberdeen.	

Elephant or Napier's Fodder Grass.

EXPERIMENTS DURING 1917–18.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

TRIALS with this grass have been conducted during the summer season of 1917–18 by various private farmers, on Farmers' Experiment Plots, and at Departmental Experiment Farms, and in reviewing the reports, it will be noticed that Elephant or Napier's Fodder grass is characterised by the following features :—

1. Remarkable rapidity of growth and stooling characteristics. The grass can be cut five times in a season, and in coastal districts will produce up to 50 tons of green fodder per acre. Two comparisons have been made with fodder cane, and in both cases the grass has easily outstripped the cane as far as yield is concerned.

2. Drought-resistance.

3. Palatability.—Up to date not a single farmer has reported adversely as to its palatability. It will be noticed, however, that reference is made to the harsh nature of the stalks if the grass is allowed to grow too high. For this reason it seems desirable to cut the grass when between the heights of 3 to 6 feet.

Up to the present the grass appears to be adapted for (*a*) soiling; (*b*) chaff. Experiments have yet to be conducted to determine its suitability for ensilage and grazing.

Farmers' Reports.

Farmers, to whom roots and cuttings of this grass were sold last season, report as follows :—

Mr. W. GOW, MACKSVILLE.—In reply to your inquiry *re* cuttings of Napier's Fodder grass, I wish to state they were about three weeks on the journey, and when they reached me they were so dry that I was very much afraid they would not live. However, I placed them in the garden under the soil and turned the spray on them, and I think I only lost about five or six. The remainder rooted, and about three weeks afterwards I planted them out in a row about 8 feet apart in poor soil, which I had prepared for them on the top of high ground. The growth from them is anything up to 10 feet high, and I would say from each cutting one would obtain 5 cwt. In fact, I have not had anything to do any good on the same piece of land, and cow cane I planted three weeks before is only about 18 inches to 3 feet high. If the grass is any good for winter feed, I do not think I would bother with cow cane again. With regard to the stock eating it, my experience is "Don't let them on it unless you want them to eat it." I intend to plant as much of it this year as I can.

I planted it about the end of September. It started to shoot about a week afterwards. It commenced to seed about the last week in March (1918), and on the 16th April I cut about a hundred heads for seed about 8 or 10 inches long. I intend chaffing it for stock later on to try for winter feed, and if you wish for further information I will be pleased to give it.

Mr. J. B. Cobb, Burringbar.—I had forty-three roots of Napier's Fodder grass from Grafton Experiment Farm in July, 1917. To-day I have 250 roots grown on a hillside in good loam. Two roots I allowed to seed, and they are 12 to 15 feet high. The other forty-one roots I have cut three times and fed to Jersey cows, and they ate it readily. When fed in the rough, the horses clear up all fibre. The bull gets a box chaffed with bran each day, and eats its readily. I find the cattle like it best when cut about 3 feet high. I shall be able to cut again in the middle of May. It is the most satisfactory fodder I have yet seen for dairymen.

Mr. P. G. Peard, Tom's Lagoon.—From the sowing of Napier's Fodder grass on the 15th November I secured eighteen plants, which made excellent growth. On 6th February I subdivided two of the clumps, securing another sixteen plants, not one of which failed, and they are now about 18 inches high. The original plants have stooled well, sending out a good strong growth of broad succulent leaves. The weather during February and March was very dry, so I took the precaution to mulch between the rows with dry grass; and although the native grasses were dry and withered, the Napier's Fodder continued to make good growth. It is greatly relished by stock, is now 3 feet high, and gives promise of succeeding well in this district.

Mr. A. J. Buttsworth, Bowraville.—All the roots and cuttings planted are doing well. From each plant a number of suckers have sprung up, and have sent up a vigorous growth, so that there is quite a clump of tall plants where there was only one before. Some of the plants are from 8 to 10 feet high, and appear to be suited to this locality. The stems are somewhat coarse, but there is a good deal of leaf, which would furnish abundance of food for stock. I have not tried it as a fodder for stock, as I want to plant it more extensively, but from appearance I think it will be an acquisition to the dairy farm. Some plants of Indian cane in the vicinity have not done half so well as the Elephant grass.

Mr. N. McLeod, Macksville.—I am not sure when it was planted, but I think it is just over five months. Soon after the shoots came through the ground we had a flood, and it was submerged for three days. I think that stunted it for some time, as it did not thrive too well. When the ground dried a little it commenced to stool out, and it grew very fast. It is just coming into seed, and is from 10 to 14 feet high, with about twelve stalks to each root. I have tried the horses and cows with a few stalks, and they eat it readily. I intend putting out a few rows next year, and try it for ensilage.

Mr. W. R. Stacey, Milvale.—*Re* cuttings of Elephant grass I got from Grafton. They rooted well, and grew to a height of about 10 feet. When I got them I unfortunately had not enough ground ready to plant them sufficiently far apart, but they thrived splendidly. Since I left my property I have been informed the plants have grown wonderfully, and that stock eat it readily.

Mr. A. W. Bender, Milbrulong.—The Elephant grass has an average of eighteen stalks to each plant, and it is 6 feet high. In the summer, while it was so hot and dry, the growth came to a standstill, but for all that it looked nice and green. As soon as the cool and wet weather set in, it made a further growth, and a quantity of young stalks are coming out again. So far the frosts have had little effect on it.

Mr. H. Puff, Queen-street, Brisbane.—I have much pleasure in reporting that the Napier's Fodder or Elephant grass is doing well. I have not had much opportunity for extensive experiments, but I find it good feed when cut young. I have allowed some of it to grow, and it measures now about 9 feet and is seeding. The soil is of a poor clayey nature, but of course we have had plenty of rain.

Mr. E. H. Willis, Lansdowne.—The Elephant grass cuttings are a great success, the plants now being 12 feet high, and out in ear. Cuttings from above have also come out in ear, after attaining a height of 5 feet. These last cuttings have only been planted about two months.

Farmers' Experiment Plots.

This grass was planted in Farmers' Experiment plots at Casino, Bemboka, and Taylor's Arm, and the following reports have been received:—

Mr. C. Oliver, Casino.—The Elephant grass stood the wet weather exceedingly well, and is still growing. I believe this grass will produce a lot of feed in the next season, if not too wet.

Mr. J. Giblin, Upper Taylor's Arm.—The Elephant grass has grown extra well, attaining a height of 20 feet clear of flower head. It also did best on deep soils. The plants are stooling well, and I have never seen anything to stool like it. I did not let the cows eat much of it as yet, but what they did get at they ate very greedily. I have reserved it to plant again in the spring. So far the seed heads are empty, but I am still watching to see if it will seed.

Mr. V. Collins, Bemboka, reports that it is stooling well, and that cattle left all the other grasses for this grass when turned into the paddock.

Satisfactory reports have also been received from Mrs. Kennedy, Picton; Mr. F. Pile, Dungog; Mr. G. Mills, Cooranbong; and Mr. J. Hetherington, Clifton.

Hawkesbury Agricultural College.

The Experimentalist at the College reports :—On the 28th June, 1916, twenty cuttings of this grass were planted at the College in rows 6 feet apart each way. Fifteen of the original cuttings rooted, and on the advent of the spring of 1916 grew very rapidly. On the 12th December of the same year the plants had stooled out to an average of twelve stems, each 4½ feet in height. Growth in the summer months was excellent, and on 1st February, 1917, it was 10 to 11 feet high, with an average of sixty stalks per stool. In eight to nine months from planting it came into ear, but did not set any seed. From the fifteen clumps a yield equal to 21 tons per acre was obtained.

Since then the plot has been extended to four rows, each 76 feet long and containing in all fifty-three clumps, and the whole plot now covers an area of approximately one-eleventh of an acre. The average height of the plants is about 12 feet.

During the summer the grass thrives to a remarkable degree, and responds very readily to an abundance of water.

In appearance it somewhat resembles sorghum, being of a strong growing nature, with coarse, pithy, non-saccharine stems, which are at the same time proliferous, giving rise to finer stems and leaves, which, in their turn, are smaller and finer in quality than those of the parent. It is this growth which has proved (during recent feeding tests) to be most palatable to stock.

It resembles Pearl Millet in its ability to resist drought conditions, and it bears a striking similarity to sugarcane, inasmuch as it can be propagated either by subdivisions of roots or from cuttings or slips.

The leaves are long, broad, soft and succulent, and are particularly appreciated by stock. The stems are too coarse to be relished in the rough state, but when chaffed are exceedingly palatable to all classes of stock. The "ears" are approximately 6 inches in length, being about ¾ of an inch at the base and tapering. At present many of the plants are in flower, but it remains to be seen whether they will set any seed.

During the past few days we have experienced one or two severe frosts, which have considerably damaged the plants, causing them to become quite bleached, and giving them the appearance of dying off.

A few sheaves of the grass were exhibited at the local Agricultural Society's Show and proved to be a great attraction to farmers, most of whom were desirous of obtaining roots or cuttings for trial on their own farms.

Its failure to set seed does not seem to be of any serious account, as the plants are so easily propagated by cuttings or roots.

On 8th October, 1917, a test was started from three clumps, to be cut, weighed, and fed to the cows every time the clumps reached a height of about 3 feet. Half was fed as chaff, and the balance as roughage. The result of these tests were the same in each case, *i.e.*, the chaffed portion was eaten with avidity, but in the rough state they ate the leaves and refused the coarse stems.

The following table shows the date of each cut, and the height and weight of the three clumps when cut :—

Date cut.	Height of the clumps.	Weight yielded by three clumps.
	ft.	lb.
7th November, 1917	2½	50
7th December, 1917	3	60
8th January, 1918	4	100
8th February, 1918	3	74
26th March, 1918	3	49

Since the date of the last cut the three clumps have made very little growth indeed.

However, the above estimate shows a yield of 5 cuts during the season's growth, which represents 60 tons per acre, approximately, of green fodder.

The feeding tests at this College were conducted during a period when there was abundance of other foodstuffs available, but notwithstanding this fact the cows ate the grass greedily.

Wollongbar Experiment Farm.

A total yield of 48 tons to the acre was obtained from the plot, and Mr. A. H. Haywood, Manager, reports that all tests carried out there show that cattle are very partial to the grass. A field test, at present being carried out with this grass, should demonstrate its value under grazing conditions.

Cowra Experiment Farm.

The plants stooled out well, and on 20th June were over 7 feet high. No weights were taken, but up to the date mentioned the grass had been little affected by the frost. It is so promising that an extension of the plot will be carried out next spring.

Experimental Work with Fruit-flies.

W. W. FROGGATT, F.L.S., Government Entomologist.

THE question of dealing with fruit-flies (*Dacus tryoni* and *Ceratitis capitata*) otherwise than by the systematic destruction of all windfalls and infested fruit, has lately been revived in this State after an interval of nearly ten years.

A certain section of fruit-growers has suggested that the Entomological Branch should undertake the artificial breeding of *Opius tryoni* for distribution in our orchards. But the large series of careful experiments carried out by Messrs. Gurney and Gallard, at our Experimental Station at Narara, all go to show that while this parasite was freely bred from fruit-fly maggots infesting wild fruits, it was a rare thing to obtain a braconid parasite from fruit-fly pupæ in oranges, apples, and other cultivated fruits. This was evidently because the ovipositor of the parasitic wasp was not able to reach the maggot in the soft tissue of the succulent fruits, whereas the larvæ could not get out of range in the more seed-like wild fruits. This is further borne out from the results obtained from the collections of infested native fruits obtained by Dr. F. Silvestri, when he visited Narara, and since distributed by him in the Hawaiian Islands. All the parasites that were collected from all parts of the world by Mr. Compere, and liberated in West Australian orchards, do not appear to have achieved any better results (for the same reason) if we can judge from the present status of the fruit-fly pests in that State.

The question of destroying fruit-flies in the adult state either by spraying the fruit trees with sweetened poisoned mixtures, or attracting them to poisoned bait in bottles or traps, is also being advocated. There is nothing new in this, inasmuch as in 1908 Professor Berlese carried out a large series of experiments in Italy, using a bait consisting of honey, molasses, arsenic, and water, which was placed in bottles hung on trees, with cotton threads hanging down to absorb the mixture and attract the flies.

Mr. C. W. Mally carried out a number of experiments in spraying trees with sweetened poisoned mixtures for the same purpose in South Africa. These are all recorded in the *Agricultural Journal of South Africa* for June, 1909.

From Western Australia we have two patent traps and baits now placed on the market for the purpose of destroying fruit-flies; the bait mixture in a more dilute form being also used as a spray over the fruit trees.

One trap, which has been distributed to a number of growers, consists of a rounded dome of glass resting on the bait-tin, above which is a small gauze wire cone or funnel above the bait with the funnel end opening into the dome above. These traps are hung on the trees with a wire attached to the top of the glass dome.

The other trap is like a small spittoon, only more open in the centre, and it is claimed that the rim keeps all the flies attracted to the bait from getting out of the tin, and there is no need for a cover. As regards the baits used, one is on the same lines as that used by Berlese and Mally; in some cases fruit juice is advised, but it does not appear from other experiments that fruit juice has any advantage over molasses as originally used. The other is also an arsenical preparation, but with a small amount of molasses, with dry pollard, and is a powder to be mixed with water, while borax is added to stop any fermentation.

Tests of both traps and baits were carried out by the West Australian Department of Agriculture in an infested orchard during the period between July, 1916, to June, 1917. For the first six months very few flies were attracted, but from January onwards large numbers were captured; in all, 18,319 fruit-flies were trapped in 240 traps of various types, placed in an orchard consisting of 5 acres of fruit trees. These flies were examined, and comprised 11,785 females to 6,534 males. It would have been interesting to have had a record of the quantity of sound fruit that was picked in this area of 5 acres where this number of fruit-flies were trapped; also whether the damaged fruit was regularly cleaned up or allowed to rot on the ground. It is claimed that one trap and bait had slightly better results than the others, and the tables furnished show such, but all tests like this should be supplemented.

There is no question that fruit-flies can be trapped and poisoned with arsenical preparations, and the fruit inspectors of the Department are carrying out various experiments this season in this direction. In the matter of traps, it is stated by many observers that no special form is required; that any shallow *clean, bright* tin, if properly baited, will catch the fruit-flies.

While agreeing that traps and spraying are good additional precautions to take in badly-infested orchards, none of the present regulations should be relaxed in regard to the systematic regular destruction of all fallen and infected fruit, as at present enforced. Anyone who knows the ordinary orchardist is quite aware that a large number will take up trapping and spraying for a time, but the majority will soon fall back into old methods. It is a question of whether it is more economical to collect and destroy infested fruit, or to set out and regularly bait and rebait hundreds of traps every week, and spray the trees after every rainstorm for six months of the year.

Clearing Land and Subsoiling with Explosives.

A LIMITED number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Field Assistant, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Diseases of the Vine.

Downy Mildew (*Plasmopara viticola*).

H. E. LAFFER, Viticultural Expert.

Downy Mildew may be considered the most destructive of all the fungoid diseases which affect the vine in any part of the world. The vineyards of Europe have been ravaged by it for many years, and it has, in many cases, brought into question the profitable cultivation of the vine. The cost of treatment is heavy; but now that the nature of the disease is understood, it presents no greater difficulties than the necessity for constant attention and the application of effective spray mixtures.

Until quite recently, so far as Australia was concerned, Downy Mildew was but a name, but, unfortunately, within the past season it has been identified upon the vines throughout New South Wales and Victoria. The area of infection is of very considerable extent, tending to prove that the outbreak is not of very recent origin, but rather that it has existed in that area for at least several years without being detected.

Its discovery is not altogether a matter of surprise to those who have watched the vine industry in the eastern States. It was recognised that the importation of vines from Europe, which has prevailed for some years, must almost inevitably result in the introduction of fungoid pests, including Downy Mildew. It was considered, however, that if such were the case, the normal climate of the country, with its dry summer months, would prevent anything like a serious outbreak of the disease. That such supposition was well founded has been amply demonstrated by the fact that it has been present already in the incipient stages for at least several years, and that it has only been the influence of the past extraordinary season which has enabled the fungus to develop to a greater extent and reveal its presence upon the vines.

Downy Mildew was introduced into Europe from America upon the wild vines. Although it exists in all the States on the eastern side of the Rocky Mountains, it has not been recorded, unless quite recently, from California on the western side. The climate of the latter State is very similar in general character to that of Australia, and it is reasonable to assume that conditions here will check anything like a serious outbreak.

The reason why our climate is unfavourable to Downy Mildew is that the spores must have free moisture upon the foliage before they are able to germinate. With the great majority of these fungi it is sufficient that the atmosphere shall be moist, in order that they may develop. Heat combined with an atmosphere charged with moisture form the conditions essential to the growth of most of these lowly forms of plant life.

Life History.

In common with other fungi, Downy Mildew perpetuates itself from year to year by means of a special type of winter spore, known in this case as an "oospore." Unlike a great number of the fungi, however, these oospores are produced sexually late in the season by the fusion of two cells, which represent the male and female elements. It is these oospores which start the course of the disease in the early spring.

Once a hold has been obtained upon the host, provided that the conditions are favourable to development, the regular formation of summer-spores or "conidia" takes place. These conidia have the power of splitting up into several smaller bodies, which are known as "zoospores" or animal spores, each one being furnished with two minute appendages, known as "cilia." These cilia, possessed of the power of movement, are used to propel the zoospore about in the film of water upon the leaves of the vine. This phase is, however, limited, and within a short time the zoospores attach themselves to the surface of the leaf, shed their cilia, and germinate like ordinary spores, by the emission of a penetrating mycelium thread.

This infection takes place, as a rule, upon the upper surface of the leaf, and from the time of germination all the mycelial development is internal.

The first evidences of disease are observed as discoloured spots upon the leaf; these spots are called "oil marks," from the appearance which they present. They eventually turn brown and tend to dry up, and, if the progress of the disease is arrested at this stage, they show no other indication to distinguish them from many harmless maladies of like appearance. It is for this reason that, in mild attacks, the real nature of the disease might readily be overlooked, as has been the case in Victoria and New South Wales.

With favourable conditions, the fungus develops rapidly, and, after a time, begins to throw out its fruiting columns from the *under* side of the leaves. These columns, or conidiophores, arising from the stomata, or breathing pores of the leaves, are branched, and carry masses of pure white spores, packed closely together, and give the under surface of the leaf a downy appearance. By the aid of a magnifying glass, these spores look not unlike masses of minute white grapes, by reason of the branching of the conidiophores.

Conditions proving favourable, these conidia are liberated in myriads at an incredible rate. They are distributed throughout the vineyards by various agencies, and, alighting upon the leaves, they pass through the zoospore stage, and germinate to form fresh centres of infection. Thus, throughout a moist summer, the spread of the disease goes on rapidly, the vines becoming denuded of foliage, in which case the crop suffers indirectly and probably fails to ripen. One prominent effect of the disease upon the foliage is that the leaves are shed from the vine, and that the leaf stalks remain attached to the cane.

The most dangerous attack is upon the fruit, which is open to infection right up to the time of turning. This stage is known as grey or brown rot, according to the appearance of the affected fruit. In the grey-rot form, the berries are attacked in the early stages of development, drying up, and exhibiting a greyish white exterior. In the brown rot, the pulp becomes soft and juicy, and of a livid colour, the berries falling from the vines. Either form is equally fatal, resulting in the partial or total destruction of the crop in a very short space of time.

So long as conditions remain favourable to sporulation, the disease continues to spread. There may come a time when further development is checked by climatic factors; but at a later period it may go forward again, consequent upon a return to damp weather.

Towards the end of summer a change takes place in the formation of spores. No longer are the branched conidiophores developed, carrying masses of summer spores. The fungus now proceeds to create a fertilised oospore or winter spore. From the mycelium arise columns carrying globular bodies of different sizes, the larger ones representing the female and the smaller ones the male element. They come in contact and coalesce, the smaller being absorbed by the larger, resulting in the oospore, already referred to. These oospores are retained in the matrix of the leaves, and, on decay of the latter, they are distributed over and in the soil. Of a very tough nature, they are able to resist damp, and are even capable of passing unharmed through the digestive processes of stock which have had access to the leaves. Thus the life cycle becomes complete, the oospores germinating in the following spring, as the weather becomes warmer, in order to establish the disease upon the young growth of the vines.

Treatment.

By virtue of the fact of the mycelium of Downy Mildew being internal, the treatment of the disease appears difficult. It follows naturally that curative treatment is out of the question, as such would involve the destruction of the tissues of the affected plant. On the other hand, it is impossible to attack the oospores, because they are largely distributed in the soil. Thus the only remedy lies in preventing the germination of the zoospores. Cure is impossible.

It has already been noted that before these minute bodies can enter on their existence, they must have free moisture, as rain or dew, upon the foliage. In common with most of the fungi, they are destroyed by contact with certain copper compounds. To this end, the vines are coated with Bordeaux mixture, and the moisture upon the foliage dissolves sufficient of the copper hydrate to kill the zoospore as it germinates. Thus careful spraying is the best safeguard, and treatment is not difficult, as it rarely happens that an infection takes place from the under side.

Leading French authorities recommend that the mixture should contain not less than 2 per cent. of copper, and therefore the Bordeaux mixture used would be of the 6—4—30 formula.

Under Australian conditions, where outbreaks would be milder than in Europe, it is possible that we should find the 6—4—40 mixture amply strong; but, at the same time, if the occasion arose for action, it would be wise, in the first spraying at least, to use the stronger solution.

The frequency of treatment is controlled by climatic conditions, and, so far, European experience is the only guide which we have to work upon. In some seasons and some localities almost constant spraying up till the turning of the berries is necessary. In those districts not so subject to attacks, three treatments appear to be a normal number in one season. The main point for consideration is that the first spraying shall be given at a time which will check the first development of the zoospores. This time is indicated by a temperature corresponding to about 54 degrees Fahrenheit, or when the vine shoots are about 6 to 8 inches in length. The time for subsequent sprayings depends on local conditions. If the season is favourable to the fungus, it is the practice to spray when the sporulation is noticed under the leaves, this being an indication of a fresh infection. If fine weather prevails, the second spraying may take place immediately prior to flowering. Should the weather at this time be showery, it will be necessary to spray when the vines are in full flower. When the embryo-grape is exposed, by the fall of the cap, is said to be a most critical time, and infection at this stage is a very serious matter. Later sprayings may be needed, according as the weather prevailing is fine or wet and unsettled.

Rapidity of treatment is a very important factor, because of the manner in which Downy Mildew develops as conditions become favourable. Tractor spray machines offer the best solution, and of these there are two upon the market for the coming season. They are horse-drawn, and the power is given from the axle of the tractor as it is drawn along. Spray nozzles are adapted to either side, and the spray mixture is discharged as the tractor passes between the rows. Such a machine will treat up to 25 acres per day, and in a most effective manner. One advantage of this method is that the treatment for Downy Mildew and the summer treatment for Black Spot are concurrent.

For small areas, the knapsack types of pump may be used, provided that the Bordeaux mixture is kept well stirred. A good machine must be looked upon as an insurance of the grape crop, and prompt treatment may mean all the difference between success and failure.

Federation Wheat in India.

At the Peshawar Agricultural Station, in the north-west frontier province of India, Federation wheat has, according to the *Agricultural Journal of India,* been grown during the past two years. It has demonstrated its capacity to outclass local varieties in yield, even under the special climatic conditions that obtain at Peshawar. For the past two years it has beaten all other varieties.

The province is noted for its low rainfall, which it is generally necessay to supplement with irrigation. In 1916 the rainfall during the growing period of wheat was 5 inches, and it was necessary to give the wheat three irrigations.

Federation is especially commended by the station authorities for its remarkable upstanding qualities and, strange to say, its resistance to smut and rust as compared with local wheats.

Pasteurisation.*

O. C. BALLHAUSEN, Dairy Instructor.

PASTEURISATION may be described as the application of heat of a certain temperature to milk or cream, for the purpose of paralysing or destroying deleterious micro-organisms that may be present.

For the discovery of this process we are indebted to Louis Pasteur, the eminent French chemist and scientist, after whom it is named. It was he who first proved that decomposition took place in milk, cream, and other foods by means of micro-organisms, and who first applied the process of partial sterilisation in controlling the fermentations in wines and beers. This partial sterilisation has been applied with equal success to milk and cream, and has proved of immense value to the dairying industry throughout the world by increasing the keeping quality of butter and cheese by the removal of milk taints. It is only in quite recent years, however, that the majority of us have had the opportunity of appreciating the real value of this most necessary part of factory routine.

Each year consumers' demands with regard to butter quality have become more exacting, and to meet this demand most factories have installed pasteurisers. It is safe to say that the present high quality of New South Wales butter is due mostly to the practically universal use of pasteurisers, together with neutralisation, by our leading factories. No doubt the cream supplied to factories, on the average, is somewhat better than that of a few years back, for which due credit must be given to the dairy-farmer; still, without pasteurisation the improvement in butter quality would not be nearly so marked.

Pasteurisation cannot be successfully used to hide defects in low second-grade cream. It is no cure-all for general neglect of the cream supplier; but if ordinary supplies are properly pasteurised, not only can reliance be placed on the destruction of all disease bacteria, but the keeping quality of the produce is so enhanced that, from a purely economical basis, the process is worth the cost. In short, successful pasteurisation depends upon the selection of suitable cream, heating it in a short time to the required temperature, holding it there for a certain time, and then cooling it rapidly to a low temperature. A machine should be able to effect perfect and uniform heating of the cream, perfect control of the temperature, quick and uniform cooling, be easily cleaned, and secure the cream against reinfection during the process.

From observation, there is a certain looseness in the practice in some factories which might be worth mentioning here. Grade notes from Sydney at times have the words "too much soda flavour." This is not to be wondered at. In some cases factories have practically ceased to regularly test cream for acidity, and rely entirely on guess-work in estimating the amount of neutralising medium to reduce it. Acidity varies, particularly through changes in weather temperature, age of cream, and the difference in quality of cream from different local centres. Guess-work is never reliable—no doubt the sense of smell or taste is very helpful, but they cannot be depended upon, and only the acid test is reliable. Properly neutralised cream is almost sweet, and has only a slight acid taste. Frequently, too, the best effects of pasteurisation are not secured, simply because contamination has taken place between the pasteuriser and the churn. A foreign flavour in butter from correctly pasteurised cream indicates contamination somewhere, and this contamination is all the more likely where a good lactic acid starter has not been used, as is usually the case. When pasteurising, greater care than ever should be exercised in having all cream vats, flumings, and other utensils in the cleanest condition possible, as a pasteurised cream affords a better field for the rapid growth of undesirable germs. Cream tanks whose condition gives the least cause for suspicion should be discarded. Whilst not suggesting for a moment that the greatest care should not always be given to the cream vats and other things, contamination in this respect is not likely to be so marked in good raw cream already containing large numbers of lactic acid-producing germs, which are able to overcome or resist the rapid growth of undesirable ones. This opens the question as to the benefits derived from the use of a lactic starter, but this will be referred to later.

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* A Paper read on 26th June, 1918, at the Annual Conference of the New South Wales Co-operative Butter Factory Managers and Secretaries' Association.

There are two processes of pasteurisation now in general use, differing slightly from one another, and known as the flash and holding methods. Each has its adherents, and each gives equally satisfactory results when correctly handled. Of the former there are two distinct makes in New South Wales, each imparting the necessary heat, usually about 180 degrees, in a rapid manner. One depends on some outside source for the entire cooling of the cream, and the other partially cools the heated cream by allowing it to come into contact with a surface already somewhat cooled by the incoming unpasteurised cream. Tests have shown that the heated cream has lost 50 degrees in its travel from the top to the bottom of the machine, and we may assume that the cool incoming cream has taken up a similar temperature. This is called the regenerative principle. This should and does effect considerable saving in steam, both in the use of direct steam to the pasteuriser and extra cooling of brine. Another desirable feature is the escape of gases by the open nature of its work. The usual rapid pipe cooler is, of course, necessary to still further reduce temperature. The other flash method effects the necessary heat by the cream being forced into contact with a steam-heated surface, and is eventually cooled by passing over two rapid pipe coolers, one containing ordinary cold water and the other cold brine. Further reduction in temperature is brought about in the attemperating tanks.

For small factories a very effective pasteuriser can be made by simply converting a rapid pipe cooler into a heater by passing hot water and live steam through the pipes. A temperature of 160 degrees to 170 degrees is obtained, and 450 gallons an hour can be heated to 160 degrees, the cream passing into the attemperating tanks. Continued heating, if necessary, is brought about by passing boiling water through the attemperator pipes. Cooling in this case is effected by first pumping ordinary cold water through these pipes, and finally cold brine. This is practically a combination of the two chief methods of pasteurisation, and has been used with success at Bonalbo Factory.

With the flash method, the use of lime as the neutralising agent often entails considerable trouble in mixing with cold cream, as the latter has a tendency to become thick or viscous unless it is warmed beforehand. Cream might be fore-warmed to 90 degrees or 100 degrees by being passed over a pipe-heater into the neutralising tanks. To save time in mixing and to ensure a more even distribution of the neutraliser, a large garden can sprinkler is useful. Pouring from an ordinary can or bucket allows the neutraliser to go almost immediately to the bottom of the vat, and a great deal more time is taken in mixing it thoroughly with the cream than if a sprinkler as suggested had been used. It is also desirable to have a good elevation for the neutralising tanks, with large delivery pipes, as by this means a steadier and full flow of cream to the machine can be obtained.

The holding process differs from the flash type in that a lower heating temperature is employed, 140 degrees to 145 degrees being rarely exceeded, and if maintained at this temperature for thirty minutes it is claimed as sufficient to destroy with certainty all organisms that are of any importance in the cream supply, and also without materially changing the physical properties of the cream, such as taste and flavour. With the development of the holding process, which enables any quantity of cream to be held at any temperature for any length of time, the heating process can be applied with exactness and with very satisfactory results. The perfect circulation and cooling efficiency of this machine makes it a very efficient cream tank. For neutralisation separate vats are not necessary; and where lime is used as a neutralising medium, the ease with which the cream is slightly warmed to permit of easy mixing is an important feature. Hot water being the medium for heating, considerable saving of fuel can be effected by utilising exhaust steam for the heating of this water. This reduces the use of live steam for water heating to a minimum.

A process of aeration, adopted by an American manufacturer, might be worth consideration in connection with the holding process. Air is blown through a cylindrical vessel 8 ft. x 16 in. in diameter, half full of lime-water. The air is forced through the lime-water by means of a pipe and into the bottom of the cream during heating, and it is claimed that a great deal of odour arises with the masses of air bubbles. Two years' use of this arrangement had proved its value.

A peculiar feature in neutralising and pasteurising with this machine is that a full vat of cream will show, with the acidmeter test, practically no reduction in acidity, when bicarbonate of soda is used as the neutraliser, and the cream has a pronounced soda flavour. With a half-filled vat, exposing the coils well above the top surface of the cream, the required reduction is indicated when again testing with the acidmeter. It appears as if the expulsion of volatile acids is hindered by the large mass of cream above the moving coils when the vat is full.

All suitable creams benefit by the aid of pasteurisation. Certainly, clean and sweet tasting cream does not require to be neutralised, but the keeping quality of butter from such cream is ensured by pasteurisation, and the use of a good lactic acid starter afterwards. Some factories only pasteurise their lower-quality creams; but this is a mistake, for very often sweet daily-delivered creams contain injurious germs which have not had time to show their presence. Certainly, butter made from this class of cream, if eaten within reasonable time after manufacture, may be satisfactory, but the keeping quality is what we have to consider. Butter recently taken out of cold store has more than ever proved the value of pasteurising all creams.

No doubt the technique of neutralisation and pasteurisation is well known now, but, unfortunately, it is not carefully followed in all its details by some factories. Too many assumptions or rule of thumb methods exist, and instead of carefully ascertaining the acidity and calculating the amount of soda or lime necessary, an amount considered by the operator sufficient for the purpose is used. The best results cannot be obtained by these methods. The process is a scientific one, and as nearly approaching scientific methods as possible in all operations should be followed. To permit of easy and regular estimation of acidity an acidmeter outfit should be kept in a good position near the neutralising vats. Records of each day's readings before and after heating and cooling, and the amount of soda or lime added, should also be kept. Mixed creams to be neutralised rarely show much less than ·3 per cent. of acidity, and it is advisable to reduce this to somewhere about ·2 per cent. of acidity. It is just here where care in adding the correct amount of soda is necessary, for without careful estimation it is quite easy to over-neutralise or render the cream alkaline. All neutralisers, whether soda or lime, should be carefully strained before placing in vats to remove any small lumps, dirt, &c. After thorough mixing with the cream, pasteurising may commence, and with a flash type of machine a temperature of 180 degrees to 185 degrees is desirable. The more germs we get rid of the better will the condition of cream be for the lactic acid starter to operate. Care must be taken not to overheat, for besides imparting a cooked flavour, the surface of the machine may be coated with partly-burnt cream. In this condition the pasteuriser will not work, and it will be found necessary to dismantle it and clean the surface. I have seen cream overheated and burnt on the machine owing to the supply from the neutralising tanks becoming low and the rate of inflow reduced accordingly. Too small delivery pipes from the neutralising tanks to the pasteuriser are generally the cause of this, as well as neglect on the part of the operator. A vat for holding the hot cream for a few minutes prior to cooling adds to the efficiency of the work, and allows for the further escape of gases. The regenerative outfits usually have something of this character, the hot cream entering at one end of this vat, and being pumped away slowly to be cooled from the other end. Exactly the same method is pursued with the holding process, except that such a high temperature is not required. The cream is heated to a temperature of 140 degrees to 145 degrees, and held at that for twenty or thirty minutes, and then cooled by substituting cold water and brine for hot water. The element of risk in overheating is not so great with this machine. In neutralising with lime a slightly different procedure is followed. When the vat is about half-full the acidity and volume are ascertained. The coils are set going and the cream heated to about 90 degrees or 100 degrees. When the amount of lime required is ascertained, about half the quantity is poured in, taking care to distribute it evenly. Whilst the rest of the cream for the vat is being pumped up, the remainder of the lime solution is being added, taking care that it is all in before the vat is quite full. Heating is then continued to the required temperature. One thing not usually given sufficient consideration is the supplying of some quick method of correctly estimating the correct volume for anything less than a full vat. A marked stick, or iron rod, might be used, divided to show hundreds of gallons. This measurement should always be taken at one end, and the marks on the rod can be made by gradually filling the vat in lots of 100 gallons of water. The vats not being rectangular at the bottom it is not possible to accurately guess the amount of cream. Cream in both instances is now cooled to the temperature desired, and in the case of the flash system run into the cream storage tanks.

We now come to the question of the use of a lactic acid starter. This seems to be a vexed question amongst factory managers, as to whether results warrant the extra trouble. When a good starter is used they undoubtedly do. A starter adds a brightness to the flavour of butter, which is lacking in that made from pasteurised cream without a starter. It is a question whether factories would not have greatly benefited in points and extra shillings, during a recent method of payment according to points, had starters been more generally used. One factory, situated in one of the most difficult centres on the Richmond, which had consistently used a starter, had most satisfactory results, far above anything that had been secured without its use. Probably the difficulty most factories experience in obtaining satisfactory supplies of milk for this purpose has been responsible for the lack of the regular use of starters. Most farmers require all their separated milk for pig or calf feeding, but a satisfactory exchange of buttermilk for separated milk can sometimes be effected, even giving two or three times the amount of buttermilk for the skim milk. Failing to secure separated milk, the most satisfactory way appears to be the use of a good, sound, sweet cream for the major part and a smaller quantity of milk daily for the mother starter.

The principles of starter preparation and propagation are now fairly well understood, but not as generally practised as understood. At any rate, a well-founded knowledge of starter-making should be regarded as one of the A B C's of butter-making and cheese-making, and the majority of factory managers possess the knowledge, even if they do not apply it. In the cultivation of a starter the best practice is to carry the starter from day to day in a small quantity. This small amount of starter is termed the "mother starter." Enamel buckets, free from chipped or broken surfaces, are usually employed for this; but glass vessels are preferable, where obtainable, for through them the condition of the curd is easily noted. Usually it is necessary to propagate the mother starter two or three times before the flavour of the lactic ferment, which is rather disagreeable, will disappear. Use fresh clean milk, which must have a good flavour. It may be either whole or separated milk. Some prefer to use whole milk, for it is easier to choose desirable samples before milk has passed through the separator than afterwards. Pasteurise the milk by heating to a temperature of 185 degrees or more, and keep it at that temperature for thirty minutes or longer, and then cool to a ripening temperature of about 85 degrees. The vessel should be well covered with several thicknesses of clean cheese cloth to prevent contamination taking place. After pasteurisation the milk is ready for inoculation, and this should be done in a quiet place where wind cannot blow dirt or dust into this clean seed-bed. Use the ferment at the rate of about 4 ounces to each gallon of separated milk, or about 5 per cent. of the previous day's culture, always rejecting the top surface to guard against possible contamination. This can be skimmed off with a sterilised instrument made for the purpose. The germs become more vigorous after a few days, and less of the culture may be added to carry on the starter. The ripened starter for inoculation can be measured accurately in a sterilised vessel, such as a cup. Be sure that the curd from the previous day is well broken, and stir the freshly inoculated milk with a sterilised metal instrument, so as to evenly distribute the bacteria. Ripen at about 75 degrees. The first inoculation from the lactic ferment should be ripened at about 85 degrees. By experience one soon learns what inoculation and temperature should be used to ripen a starter in a given time. Care should be taken that the temperature is fairly even, and it should not be allowed to drop below 65 degrees. The starter is ripe when curd forms, and it should be smooth and soft, and like custard in appearance, and not hard and firm. It should be smooth and compact, without gas pockets, as gas shows the presence of undesirable germs. A hard, lumpy curd, whey, and a high acid show over-ripeness. Smell and taste it, but not from the containing vessel Always pour some of the curd into a spoon or cup and immediately replace the cover. A desirable mild acid flavour should be sought. As before mentioned, the first propagation is likely to be somewhat unpleasant because of the presence of some of the original medium. Along with the "mother starter" a second starter should be carried. This should consist of sweet pasteurised cream heated and cooled as for the mother starter. It will be necessary to agitate this larger quantity during pasteurisation and cooling, and the pasteurisation temperature need not be above 180 degrees for ten minutes or so. After inoculation with about 5 per cent. of the mother starter, this second starter will be ready for use the following day, and may be added at the rate of 1 per cent. to 2 per cent., care being taken to thoroughly mix it with the cream in the vat to produce an even ripening.

And so on, a fresh lot of cream is carried on alongside the mother starter from day to day. The Coraki Factory has had this method of carrying a starter in use for several years, with most satisfactory results. A good starter with care should last for several months without renewing the ferment. This depends entirely on the methodical care and attention devoted by the operator to guard against all possible forms of contamination, but this is not difficult where proper utensils are provided, a suitable room is available, and sufficient interest is taken in the work.

PURE SEED MAIZE—CO-OPERATION BY FARMERS.

OWING to the value of acclimatised seed maize, and the danger of its becoming impure in cross-fertilisation, it has been the policy of the Department, in order to ensure pure seed being available to farmers, to have only one variety grown at each Experiment Farm, where it undergoes systematic improvement for yield and quality.

As these Experiment Farms are not representative of every large maize-growing district in the State, the principle has been extended to include other districts, where this improvement system has been undertaken, under Departmental supervision, by the co-operation of reliable farmers in these districts.

In order to further extend this work and to cater for other important maize-growing centres, the Department would be glad to hear from farmers who are already specialising in, or who are willing to specialise in, the production of pure seed maize by co-operation with the Department.

The object of this is to get one or more reliable farmers in each district where there is no Experiment Farm to grow pure seed maize of a variety which is suited to the district, so that he can supply pure seed of good quality to farmers in that or any other district who may require it.

As varieties of maize cross-fertilise very readily, this would entail the growing of one variety only, or ensuring that this variety is not crossed by others, so that it may be kept pure.

A special seed plot, about an acre in area, planted with the best selected ears of the variety would be required, and where possible this plot could be utilised as an ear-to-row test or experiment to determine the best yielding types of ears of the variety. At the same time the variety would be improved in yield and quality.

Tests have shown that the yield of a variety has been increased by 10 bushels per acre by this system.

All communications should be addressed to the Under Secretary and Director, Department of Agriculture, Sydney.

Poultry Notes.

AUGUST.

JAMES HADLINGTON, Poultry Expert.

DURING the last few months seasonable work on the poultry-farms has embraced selection, mating of breeding stock, hatching, and rearing of chickens. These matters form, as it were, the foundation upon which the poultry-farmer must build his year's work and, to a large degree, his future success. But unless good stock and good breeding are followed by good rearing after the chickens leave the brooders, failure or partial failure will result. It is not sufficient that we secure so many well-bred chickens; we must grow them well, or good breeding will avail little.

Complaints have been heard during the past winter that pullets have not come on to lay as well as might have been expected. Various theories have been propounded to account for this, but the question of development does not appear to have entered into the calculation as it should have done. The winter has been cold and long, and this is calculated to have been a factor in retarding laying to some extent; but, so far as observation over a large number of farms goes, the one outstanding cause appears to have been the poor development obtained in the pullets. This, unfortunately, is not confined to one year, but is more or less a permanent factor occurring in different yards, and in some year after year. There is no better evidence in regard to the part good development plays in autumn and winter laying than that afforded by the last three laying competition results. This is referred to in my address at the Hawkesbury Agricultural College Poultry Farmers' Conference, where it was shown that the penning of birds of better physique had resulted in better general average over the first three months in the proportion of 40·3 to 25·8; and the same factor had apparently increased the general average over all first-year sections, from 184 to 206, as compared with the previous plan of admitting birds regardless of development. It will therefore be seen how important it is that the best possible development be secured. The question is: How is this development to be obtained? Firstly, by proper brooding; secondly, by proper feeding; and thirdly, by adequate housing and intelligent management of the chickens during their entire period of growth to the adult stage. One of the greatest weaknesses in the chain of factors necessary to secure good development is at the point where chickens are taken from the brooders. Chickens that have been accustomed to heated brooders, of whatever kind, should not be removed from them at too early an age; five or even six weeks in cold weather is quite early enough to take them away from the warm brooders into cold houses. It is at this stage that thousands of chickens receive a check in growth from which they never properly recover; not to mention the severe losses experienced.

These troubles often occur through transferring the chickens from the warm brooders to open-fronted poultry houses. What is required is a stage between these two, the use of "weaning pens," where the chickens are brought from 6 to 10 or 12 weeks old. The pens in use for this purpose at the Hawkesbury Agricultural College are enclosed both back and front, with the exception of 10 inches at the top of the front, which is wire-netted, and the size of the houses is 6 feet by 8 feet, with yards 30 feet by 8 feet. When the chickens are first transferred to the houses, a cover board, 4 feet by 3 feet, is used for a few days. This can be placed against the wall of the poultry house at an angle of about 45 degrees, and the chickens induced to camp under it. The end is kept clear of the corner by about 6 or 8 inches, so that while forming a cover under which warmth is conserved, there is still ample ventilation passing over the chickens to carry away the bad air exhaled by them.

Feeding Chickens.

Another cause of poor development is faulty or insufficient feeding. Many of the so-called labour-saving methods of feeding chickens are responsible for poor results. An attendant who is not prepared to make six or eight visits per day to the chickens, whether to feed or not, is not likely to be a successful chicken rearer, or to secure the necessary good development.

Moist mash, when properly prepared, gives better development than feeding on all dry materials. Pollard and bran mixed with milk, or soup for preference, and seasoned with salt, makes excellent food for chickens. From two-thirds to three-fourths of the day's feeding may consist of this, while the balance can be chicken mixture up to 6 weeks old, from which age wheat and crushed maize can be substituted for the chicken mixture.

The method of feeding chickens at the Hawkesbury Agricultural College is to start to feed after forty-eight hours by giving rolled oats, such as is used for breakfast foods, for the first two days; this is followed by the above mash and chicken mixture. The proportion of bran and pollard forming the mash will vary according as to whether the pollard is fine or coarse; the main thing is to make a nice crumbly mash (not wet or doughy); and it should be understood that bran is one of the best foods, and is not inferior to pollard in food value.

The following will be found a guide to feeding chickens:—

First, let them fast for forty-eight hours; next two days feed rolled oats; six feeds per day to 6 weeks old, four feeds per day from 6 to 12 weeks, and three feeds per day from 12 weeks to 6 months.

Good succulent green food should be given through all stages from two weeks onward. The feeding should be done skilfully, the aim being to keep the chickens always keen for their food, while at the same time giving plenty of it.

Keep the Chickens Developing.

Another practice calculated to retard proper development is keeping the chickens shut up in small yards longer than twelve weeks. After this age more range should be given, and, if possible, fresh ground and a change of environment. It is surprising the effect these factors have in promoting development and building up a robust constitution.

Feeding Adult Poultry.

With the present rate of progress that is taking place in the poultry industry, some scarcity of food-stuffs other than wheat and maize threatens to become a factor that will have to be considered. The Under Secretary and Director for Agriculture, Mr. Valder, had something to say on this matter at the recent Poultry Farmers' Conference, and warned them to be on the lookout for substitutes, mentioning the possibilities of lucerne in this direction, and said that it was intended to carry out some experiments to determine the extent to which lucerne could be used as a food for poultry. In the meantime it may be mentioned that, as a matter of practice, we know that 15 to 20 per cent. of the morning mash may consist of lucerne dust or good lucerne chaff, but it does not follow that any lucerne chaff is good enough. The writer very often sees lucerne being used to feed poultry that is calculated to cause poor laying results, ill-health, and many deaths. It should be remembered that fair average samples of lucerne chaff contain somewhere about 25 per cent. crude fibre, and bad samples would contain a great deal more. Fibre, it may be mentioned, only serves to clog the digestive process, without giving nourishment. Poultry-farmers will be well advised when using lucerne chaff or dust to be careful to secure good samples. Many of the supplies of so-called lucerne dust contain much dead material, and are little else but machine-crushed lucerne stalk, in which the fibre content is very great. There are other materials which will help to make up a ration; among those available are linseed meal and coconut oilcake. These may be used up to 10 per cent. of the morning mash, while chaffed green lucerne may be used in place of the dry article. It is feared that most other substitutes that might be suggested are prohibited by their high cost.

PURE SEED MAIZE FOR SALE.

The Department of Agriculture has a limited amount of pure *selected* seed maize for sale for the coming season, both for grain and fodder purposes, as follows:—

Variety.	Seed available at—	Railway Station or Wharf.
Improved Yellow Dent Leaming	Grafton Experiment Farm	Grafton.
Red Hogan	Hawkesbury Agricultural College ...	Richmond.
Early Yellow Dent	Glen Innes Experiment Farm... ...	Glen Innes.
Silvermine	Yanco Experiment Farm	Yanco.
Funk's Yellow Dent	North Bangaroo Stud Farm	Canowindra.

The price is 7s. 6d. per bushel f.o.r. or f.o.b. at the station or wharf mentioned. Bags, 9d. each extra.

As the supply is limited, intending purchasers are recommended to apply at once direct to the respective Experiment Farms, but inquiry should be made to ascertain whether the required quantity is in stock before remittance is sent.

All orders should be accompanied by remittance, with exchange added for cheques.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bimbaya.

A meeting of this branch was held on 19th June, when an interesting discussion took place on the seed drill *versus* hand sowing. The advantages claimed for the seed drill (a large saving in seed, a more uniform depth of sowing, and a more economical distribution of manure) were conceded, but the actual saving on a small acreage was considered negligible when interest on the capital invested in the machine, together with repairs and depreciation, were provided for. The only means of overcoming this objection that met with favourable consideration lay in the direction of joint ownership. By this means it was thought that one or two machines could be made to serve the purpose of twenty separately-owned machines.

Buckaroo.

A paper, of which the following is a summary, was read by Mr. S. E. Elphinstone to members of this branch at a meeting on 27th April.

BEE CULTURE.

There are few branches of farming which need closer study and attention than bee-keeping, but there is a very fair thing to be made out of the apiary, providing the bees are properly looked after.

Generally, in this district, there is no need to go hunting for honey-producing trees and plants, as almost anywhere the bees will do very well if properly looked after. A sheltered position, handy to the honey-room or the building in which it is proposed to do the extracting, must be selected. My idea is to have protection from the south and west, with the hive entrances facing either north or east. In an apiary of ten or twelve hives, or at most of twenty hives, there is not the same need for careful planning as in a large apiary, and the best arrangement is one or two long rows. It is much easier to attend to the hives if plenty of room is allowed behind them. If possible, allow 6 feet between each hive in the rows. On no account should they be closer than 4 feet from centre to centre. It is often said that beehives must be on a stand with legs, so as to allow some means of protecting them from ants; but all my hives are within 3 inches of the ground on four bricks, or else on concrete bases, and I have no trouble with ants. There are others who have their hives on stands 18 inches high, but they are always complaining of the ants. Solid concrete bases have many advantages, one of the most important being that if the bases are put down properly the hives never cant over and get out of plumb. Then again, the concrete prevents mice from making their nests under the hive and raiding the combs at night time.

Since the Apiaries Act has come into force we cannot entertain anything but movable frames and a proper box, nor should we ever wish to revert to the old gin cases and the breaking up of the combs to get the honey out. It always pays to buy a good dovetailed box and solid bottom boards and covers; but with the tools, sufficient time, and a small knowledge of carpentering, a very good hive body can be made out of naphtha cases. It is very important to have the bottom box or brood chamber made well, and free from any cracks and crevices. Not only do the cracks allow cold draughts in winter, but they make it easier for robbers to overcome a weak colony. It is a great comfort, too, to know that the bees only have the one entrance—and that in the front of the hive—when the hive is being robbed.

The frames should be factory-made, and the Hoffman pattern is the most popular style. It is self-spacing, with V and flat joints on the sides, which allow the apiarist to press the frames tightly together, and yet to know that they are the right distances apart. If these frames are put together properly, no matter which way they are put in, they will have the V-edge against the flat edge of the next frame at each end. The frames should be wired with at least three wires in the depth of the 9-inch frame: this prevents the combs from falling in hot weather, and also strengthens them for the extractor. Comb guides will be found necessary to ensure that the bees build one straight comb in each frame, and not across the whole of them in a diagonal fashion. Generally it will be found that about 1 inch of moulded wax foundation fastened along the top-bar of the frame will give this desired result, but I always like to use a full sheet of foundation in each frame with the wires embedded into it.

The whole of the outside of the body and the bottom boards, and both sides of the cover, should receive three good coats of the best oil paint. The bees should be transferred into their new quarters in the spring or during the summer honey-flow, as there must be a fair flow of honey coming in to allow them to start comb-building.

Blacktown.

The Agricultural Exhibition held by this branch on 3rd and 4th May was a great success. The Secretary reports that approximately a sum of £300 was expended in advertising the district's productiveness, and it has already been decided to hold a three days' exhibition at Blacktown on 13th, 14th and 15th March, next year. Promises have been received of contributions amounting to no less than £69 13s. towards the expenses in connection with next year's exhibition.

The number of members at Blacktown now totals over 100, and the branch is to be congratulated on the extent of its operations.

Cardiff.

A pruning demonstration was given by Mr. W. le Gay Brereton, Assistant Fruit Expert, at Mr. A. Barrett's orchard on 23rd May. Over sixty fruit-growers were present, and keen interest was exhibited in the work done.

At the last meeting of this branch, correspondence from the Agricultural Department was read relative to the destruction of a very large flying-fox camp at Martinsville. The branch had expressed the opinion that the work of destruction could not be regarded as a local one, and the Department had written that an inspection would be made when the flying foxes returned about December with a view to trying methods of destruction. The camp is situated within flying range of extensive fruit-growing districts.

Clovass.

A meeting of the above branch took place on 19th June, general business being transacted.

Coraki.

A meeting of the above branch was held on 18th June. A discussion in connection with the forthcoming Coraki show occupied a considerable part of the meeting.

Cotta Walla.

A meeting of the above branch was held on 27th May, when a paper on pasteurisation was given by Mr. W. A. Smith.

Cunningham.

A well-attended meeting was held on 28th May, when a lecture was given by Mr. E. Breakwell, B.A., B.Sc., Agrostologist, on noxious weeds.

Six new members were enrolled.

NOXIOUS WEEDS.

Mr. Breakwell said that owing to the extremely wet seasons of the last few years, weeds and thistles threatened to take possession of all old cultivation lands. The matter was therefore of the greatest importance. Many weeds and thistles had a fodder value, but generally this was overestimated, and the very best of them did not come up to the grasses or leguminous plants. He trusted the shire and municipal councils would make destruction compulsory. The Local Government Bill that was ready for presentation to Parliament would give ample authority. About fifteen different varieties of weeds were dealt with, including Wire Weed or Hogweed, St. John's Wort, Paterson's Curse, Stinkwort, Wild Mustard, Dock, Sorrel, Variegated Thistle, Black Thistle, Saffron Thistle, Slender Thistle, and Star Thistle. Other varieties were mentioned in the discussion which followed.

Mr. H. **Hall** said that unless united action was taken the weeds would take possession of the district.

Mr. B. J. **Stocks** considered noxious weeds had depreciated the value of the cultivated land from 25 to 30 per cent.

The Mayor (Alderman R. J. **Kelly**) and Alderman **Bembrick** mentioned that the Municipal Council had spent about £30 a year for the last five years in cutting weeds on the roads.

Satisfaction was expressed by other members that the Shire Council had now taken the matter up.

A vote of thanks to the lecturer was passed by acclamation on the motion of Mr. Rolfer (Chairman), seconded by the Mayor.

A meeting was held on 21st June, when general business occupied the time.

Glenorie.

A meeting of this branch was held on 25th May, the Chairman and other members of the Cattai branch being present to discuss the question of procuring cheaper farm and orchard necessaries. A useful conversation took place, which it is hoped will be productive of good.

Holbrook.

A meeting was held on 25th May. Mr. Kendall stated that on the Government experiment plots the early sown wheats were now up, while the late varieties and four samples of oats would be sown shortly.

Lidcombe.

A well attended meeting was held on 17th June, when an interesting and instructive lecture was given by Mr. E. Breakwell, B.A., B.Sc., Agrostologist, on fodder crops.

Grasses and Fodder Plants.

Owing to the fact that Lidcombe is not a dairying or pastoral centre, the lecturer gave a somewhat popular account of the work the Department is doing in this direction.

The Department, he said, was carrying out work with both introduced and native grasses, and was obtaining all the data possible. Introduced grasses were, of course, adapted for cultivated pastures, such as were common on the Coast and Tablelands. Native grasses, generally speaking, were not laid down in cultivated land, and to obtain the best results from them, careful management, such as subdivision of paddocks, allowing the grasses to seed, and thickening up the pastures, were necessary. Lantern slides, illustrating how our native pastures may become useless and unproductive through bad management, were shown.

The history of paspalum was briefly related. As far as experience went, farmers were very divided in opinion concerning it, some maintaining that it should never have been introduced into the country owing to its remarkable aggressiveness, and others actually calling it a godsend, inasmuch as it had retrieved previously hopeless failures as far as dairying was concerned. New localities were constantly taking up the grass, and encouraging its growth. It was now in favour on the Tablelands, in elevated districts as high as Moss Vale. In other districts many farmers that formerly had been strong adherents of paspalum were now wavering somewhat, and were realising that a change of feed was desirable. The trouble was that it was what might be termed "a lazy man's grass"; many farmers would not go to the trouble of laying down an area of, perhaps, more palatable and nutritious grasses because it gave them more work and expense than paspalum.

Many introduced grasses were being improved by the Department by means of selection. The grasses were grown in plots, and were kept free from stock. The seed of the best plants was harvested, and the plots were extended by sowing the seed of these. Results in this direction were very promising, not only in this State, but in Canada and the United States, where similar work was being carried out. Such grasses as *Phalaris bulbosa*, the Fescue grasses, Cocksfoot and Timothy appeared very susceptible to improvement in this way. In addition, the Department noted any grass that was doing well in foreign countries, and imported and tested samples of the seed. Any successful sorts were extended to plots on the Experiment Farms, and were distributed amongst farmers as much as possible. Good results had been achieved in this direction with Sudan grass and Elephant grass.

As regards native grasses, New South Wales had a rich heritage indeed. There were very few altogether useless native grasses, and those which were a little harsh were extremely hardy and drought resistant—the Spear grasses and several members of the *Eragrostis* family were examples. If Australia wished to maintain her superiority as the greatest wool-producing country in the world, every pastoralist would require to manage his pastures with greater care than in the past. The Department was carrying out experiments with a view to determining the deterioration that takes place in pastures by means of overstocking, and the methods that might be adopted in conserving and improving the pastures. There were certain native grasses like Coolah grass, Warrego Summer grass, Native Millet, and Danthonia grasses which improved under cultivation, and experiments were being conducted as to the practicability of laying down pastures of these grasses in wheat-growing centres. If this could be done, wheat farmers would be able to carry more sheep on their areas than at present. It was possible that some introduced grasses like Rhodes grass, Sudan grass, and, in some parts, paspalum, could be utilised in many inland districts; but, generally speaking, the native grasses could not be excelled for permanence, nutritive qualities, and endurance under stocking.

In addition to the work with grasses, the Department was also carrying out useful experiments in connection with the improvement of clovers, saccharine and grain sorghums, and miscellaneous fodder plants. Reference might be made to Chilian clover, the first red clover which had been successfully grown at Hawkesbury Agricultural College, and which was in favour throughout the Tablelands and Coast. Ladino, an improved form of White clover, Spineless Burr trefoils and Subterranean clover were also receiving attention. Sorghums laid themselves open to considerable improvement by selection, and the results from the work were already very promising. The attention of poultry farmers in the Lidcombe district might be directed to some of the grain sorghums. These were largely grown in the United States of America for food for stock of all kinds and for poultry. Although it was doubtful whether it would pay poultry farmers to grow these sorghums for food, they could be tried on a small scale, and the poultry people might then form their own opinion on the matter. Packets of seed of these sorghums were distributed, and also the seed of any grasses which members might have liked to try. The lecturer concluded with a short reference to the manner in which the spread of noxious weeds was seriously affecting good farming, and the urgent need for legislation to deal with the matter.

Matcham.

A meeting of this branch was held on 25th May, when discussions took place on "Rotation of Vegetable Crops" and "Woolly Aphis." A spray giving good results locally in connection with the latter is a red oil, 1 in 20, with ½ lb. washing soda to the gallon.

Miranda.

At a meeting of the above branch on 29th April, the question "Why do we not get eggs in autumn and winter?" was discussed in various aspects. The hall was crowded, about 130 members being present.

AUTUMN AND WINTER EGGS.

Mr. C. E. **PAYNE** opened the discussion. He could not understand why he did not get eggs, as his birds were receiving the same treatment as in previous years when he was most successful.

Mr. A. J. **BURTON**'s opinion was that the ever-changing quality of the pollard was responsible for constant changes in the balance of the ration. He also opined that to get favourable results from pullets, they must be domiciled in their laying quarters a reasonable time before commencing to lay.

Mr. R. E. Howcroft contended that to produce eggs at that particular time of the year they must feed heavily. He gave a detailed account of how to feed for favourable results.

Mr. E. W. Phillips said that after making a comparison of the habits of the jungle fowl and the domesticated fowl of to-day, and assuming that the feeding was right, he had come to the conclusion that the failure of so many poultry farmers to produce winter eggs was due to faulty housing with a tendency to overcrowding, which was particularly detrimental to the laying hen. The perches should be at least 3 feet from the front of the house, and there should be a liberal allowance of perch room for each hen.

Departmental Note.—Mr. J. Hadlington, Poultry Expert, commenting on the above discussion, remarks that the main factors governing autumn and winter egg-production do not appear to have been discussed. They are, the time the pullets should be hatched and the development that must be obtained to get pullets to lay at that period. Unless pullets are sufficiently well developed and start to lay before the cold weather sets in, they rarely do much good until July. The change of pollard would not necessarily affect the balance of the ration, for the difference in the food value of coarse and fine pollard would not be material, nor would even the difference on analysis between ordinary pollard and bran, though bad pollard might do it. The references to housing and to domiciling the hens in their winter quarters well in advance of laying, touched material points.

Moss Vale.

Some months ago, Mr. Orwell Phillips presented a silver shield as a trophy, to be competed for annually by branches of the Agricultural Bureau which staged exhibits representative of their districts at the Berrima District Show. The shield was won on the first occasion by the Moss Vale branch, and the pleasing ceremony of handing it over to the Chairman (Mr. L. T. Badgery) took place at Moss Vale on the 24th June. The presentation was made by Mr. T. H. Throsby, President of the Berrima District A. H. and I. Society, whose congratulations were supplemented by several other gentlemen, including representatives of the other competing branches. Appreciation of Mr. O. Phillips' generous gift was unanimously expressed, and hints were dropped of keen competition at the next show.

Narellan.

A pruning demonstration was given under the auspices of this branch on 23rd May by Mr. J. T. Moody, Assistant Fruit Expert. The attendance was highly satisfactory, and keen interest was taken in the methods of pruning advised. Mr. D. Asimus made his orchard available for the purpose.

Nimbin.

A meeting of this branch was held on 25th May, when a lengthy discussion on the cross-breeding of pigs took place.

Penrose-Kareela.

A meeting took place on 8th June. A discussion took place on woolly aphis, and general business was also transacted.

Quaker's Hill.

A lecture was delivered by Mr. H. E. Laffer, Viticultural Expert, before this branch on 25th May.

The growing of table grapes for the Sydney market was advocated, the geographical position of Quaker's Hill and closer settlement both being in keeping with the production of that class of grape. Subsoiling would be necessary on account of the stiff nature of the soil. The correct method of planting was indicated on the blackboard. Pruning to ensure shape and vigour, manuring, draining, cultivating and laying out a vineyard were dealt with in turn. The varieties advocated were :—*Black* : Black Muscat, Müscat Hambro, Black Hamburg. *White* : Doradillo, Belas-Blanco, Valeney, Daria, Ohanez. The vines should be planted 9 feet between the rows, and 8 feet apart in the rows. For winter swabbing for Black Spot, a 10 per cent. mixture of sulphuric acid with water was advocated.

Springside.

A meeting of this branch was held on 21st May. A paper, of which a summary follows, was read by Mr. Smith.

Keeping Bees for Profit.

The farmer who desires to keep bees for profit has three main points that he must consider : First, good hives and fittings ; second, the class of bees ; third, some knowledge of their habits and diseases.

In this district, where cold winters are prevalent, a good dove-tailed hive body, constructed of not less than 1-inch timber, and suitably roofed, should be used. A coat of paint should also be added. A warm home is then assured.

There are many breeds of bees to select from, but two only are worth taking into consideration. These are the Cyprian and the Italian. The Cyprian is a golden bee, and an excellent honey gatherer; she defends her home well, but she has the objectionable habit of stinging on any or no provocation. The Italian is an excellent bee, and although supposed to have three gold bars, the colour is not so brilliant as many imagine, so-called Italian bees being merely a cross between Cyprian and Black. The Italian bee is a good honey gatherer, works later in the year than the Black and defends her store well, but is a robber. Hence, when working among them do so quickly, and close the hive against robbers.

The worst disease that attacks bees is foul-brood. It is infectious, and should robber bees enter an infected hive, they are sure to carry it home. It is recognised by the brood cells turning dark in colour and having a sunken appearance. In the later stages the hive gives off a smell like glue. The best means to eradicate it is to burn bees, honey, and comb and frames. Pour kerosene on the inside body of the box and then burn it off. Chilled brood is often taken for foul-brood. This is caused by exposing the hives when weather is too cold.

The wax moth is sometimes a pest, and the best method is to prevent him getting a hold by having well-painted boxes.

In conclusion, don't worry the bees. Do all necessary work promptly and carefully, and always remember that one-half of the game is to know how to leave them alone.

St. John's Park.

At the April meeting a lecture was given by Mr. J. C. Scott, of which a summary follows.

Breeding and Brooding Layers.

Owing to the prices of material and the difficulty of getting supplies, breeders would have to adopt the flock system of mating for some time to come if they intend to increase their flocks. Small yards were a menace to the health of the birds; and it was desirable, if the flock system was adopted, to cut out some of the partitions, making large yards, so that the male birds would have opportunity for free movement, thereby ensuring better fertility.

Hens that moulted early, say in February or March, were laying again by June, which meant that they would be good birds for the breeding pen. Late moulters were more profitable as layers, but, unfortunately, they moulted just as the breeding season commenced, and no chickens could be expected from them until the middle of September. This forced the breeder to breed from pullets in order to ensure sufficient chickens in time. Providing the pullets had been hatched not later than August, and if they had been well matured, and had started laying early, nothing need be feared. This referred only to one year however, for it was unwise to breed from pullets that had themselves been bred from pullets. It was much better to breed two years in succession from the same birds—one year as pullets and the second as hens, after culling and after the moult was over.

The keeping of birds through the moult was a heavy drain on the poultry keeper; but if this method was adopted, it would only be necessary to keep the hens through the moult every second year. Cockerels for breeding should be hatched not later than the middle of August. June was early enough to mate up, and the middle of July was time enough to set the first machine. With fair brooder treatment, early August birds would mature as soon as July hatched ones. Faulty brooder equipment compelled people to put eggs in the incubator when they were worth 2s. to 2s. 6d. per dozen, so that the chickens might be forward enough to lay in the autumn. No chickens should be hatched after September. He believed in the open-fronted brooder house, providing each box had a roomy nursery of at least 12 inches high, 4 feet x 2 feet, the brooder to be of the same dimensions. He believed, too, in runs under cover until all chicks were six weeks old; after that as much room as possible.

Departmental Note.—Mr. Hadlington's opinions on brooding questions appeared in the poultry notes for July.

At a subsequent meeting, which was also well attended, a very interesting lecture was delivered by Mr. A. E. J. Anderson, of the Lidcombe branch, on propagation methods.

Tallawang.

The following report on manurial trials with Sudan grass, conducted at the public school under the auspices of the branch, is furnished by the Secretary, Mr. S. E. Hinder.

Manurial Trials with Sudan Grass.

In the main, the experimental work with this fodder grass carried out by the pupils of the school under my charge during the season just concluded, continued the work referred to in the *Agricultural Gazette*, September, 1917, page 619.

So far as the hay weights per acre are concerned, the results now under review do not appear to be good in comparison with those recorded last year. This is attributable to two causes; first, the dry summer, and second, the low rate of seeding employed throughout. A uniform sowing of 10 lb. per acre was adopted, but in future I would use nearly double that rate. Thanks are due to Mr. H. C. Wood, of Gosford Farm Home for Boys, for a supply of seaweed ash, and to Mr. F. B. Guthrie for an analysis of the ash, which latter showed an equivalent of 5 per cent. of sulphate of potash.

The plots were sown by the boy pupils on 20th October, since when the rainfall has been as follows:—October 65 points, November 438, December 211, January 165, February 85, March 48, April 105, May 55.

The following are the yields of hay obtained per acre:—

	1st Cut.		2nd Cut.	
Sown at 16 lb. per acre, unmanured—	tons	cwt.	tons	cwt.
Acclimatised seed	1	10	0	16
Introduced seed	1	6	0	10½
Sown at 10 lb. per acre—				
Unmanured	1	2	0	8
50 lb. No. 8 Fertiliser	1	5	0	8
75 ,, No. 8 ,, ...	1	5	0	15
100 ,, No. 8 ,, ...	1	14	0	10
100 ,, No. 10 ,, ...	1	18	0	5½
50 ,, Seaweed ash	2	9	0	16
30 ,, Seaweed ash and 30 lb. No. 10 Fertiliser...	2	7	0	13½
10 tons Stable manure	1	7	0	13

There is a marked variation in these results, which it would be hard to account for, particularly as a germination test showed an average of 96 per cent.

The response to the inclusion in the fertiliser of seaweed ash, for the sake of its potash content, is worthy of note.

It might be remarked also that the soil would be classed as poor for wheat.

In addition to the above tests carried out in the school area, an area of slightly under a quarter of an acre was sown as a palatability test. This experiment was sown in a paddock of choice wheat land in the middle of November, and the growth was remarkable. The sheaves when cut on the 1st February were on the average well over 7 feet high, and I personally measured two or three over 8 feet.

After once tasting the grass, milking cows and plough horses preferred the grass far before the natural herbage, eating it right to the ground. Pigs, however, showed no liking for it.

MAIZE TRIALS.

Mr. Hinder also reports concerning certain maize trials conducted at Tallawang.

Seed of five varieties was supplied by the Department of Agriculture, viz., Boone County, Leaming, Silvermine, Reid's Early Dent, and Funk's Yellow Dent. In addition, seed of Hickory King was purchased from the Department, and two local unnamed varieties were tried. In order that the Hickory King crop sown at the school might be kept pure, I arranged with two local farmers to put the other varieties in as indicated.

On the farm of Mr. G. Lincoln, the soil was a rich chocolate loam, and sowing took place on 29th October, and the maize was harvested on 25th May. The rainfall here was: November 438½ points, December 211½, January 165, February 85, March 48, and April 105.

At Mr. W. Tranter's farm the soil was a sandy loam. The seed was sown on 4th October, and the crop was harvested on 4th April. The rainfall was:—October 275 points, November 438, December 211, January 165, February 85, and March 48.

The results were:—

Variety.	Mr. G. Lincoln.		Mr. W. Tranter.	
	bus.	lb.	bus.	lb.
Hickory King	18	48	19	44
Boone County	18	22	....	
Leaming	18	22	....	
Local	12	53	18	48
Silvermine	....		16	40
Reid's Early Dent	....		15	54
Funk's Yellow Dent	....		15	47

It is interesting to add that in the boys' competition plots, using fertiliser on a very poor soil, Hickory King yielded to 27 bus. 48 lb., the other varieties not being tried.

Tallong.

A meeting of the above branch was held on 6th July. A lecture was given by Mr. Lambeth (Wingecarribee Shire Clerk) on book-keeping on the farm.

Thyra-Bunaloo.

At a meeting on 25th May, a paper was read by Mr. P. W. Sinclair, from which the following is extracted:—

THE CAUSE OF MORTALITY AMONGST YOUNG SHEEP LAST SEASON.

In my opinion, the great mortality amongst young sheep during the season 1917–18 was due to the prevalence of what is known as lung-worm. This was brought on by the long wet season, causing the grass to be rank and of little value as a nourishing food for sheep with their milk teeth, by overstocking, and by sheep becoming infected from the tanks they drank from. When the lung-worm is rampant, stomach and intestinal worms will always be found. These worms cause scouring and loss of condition to the sheep through the worms absorbing all the nourishment out of the feed and poisoning the system.

The symptoms of lung-worm trouble are a bad cough and discharge from the nostrils, caused principally by the worm setting up an irritation in the bronchial tubes, which affects respiration. This causes a discharge from the nostrils, and the whites of the eyes become very pale in colour instead of being bright and streaky, like little veins. If sheep that are badly affected are driven hard, they will often be seen to stagger and drop down as if dead. This is caused by the sheep getting warm and the worms wriggling about in the windpipe. If left to itself the sheep will often eventually recover.

If a post-mortem examination is made of a sheep affected with lung-worm, long thread-like worms of a red colour will be found at the base of the windpipe. The examination must be a close one, or the worms will be missed.

The only way to deal with sheep with this trouble is to drench them two or three times, and to put them in a fresh paddock, if possible, where they can get a good lick.

There are many preparations in the shape of drenches and pills, and some of the commercial ones are good, but I have found that arsenic and Epsom salts give the best results. All you have to do is to put the sheep in the yard the night before drenching, and keep them there for two hours after drenching.

A good lick can be made by mixing with a bag of salt 5 per cent. of sulphate of iron, some Epsom salts, and a little turpentine. The last may be left out if there is difficulty in getting the sheep to take it.

Valla.

A meeting took place on 5th June, when Mr. P. G. Hampshire, Dairy Instructor, delivered a lecture on the care of cream. There was a good attendance of members, who fully appreciated the instructive address.

Windsor.

The members met on 21st June, when a paper was read by Mr. Smith. The following paragraphs are from it.

CITRUS CULTURE.

Before commencing to plant at all, find out what varieties thrive in your particular district, and plant only three or four of the most suitable. This necessary and most valuable information is best obtained from more experienced local growers.

Having made your choice as to varieties to be planted, endeavour to obtain well grown trees from a nurseryman whose trees can be recommended as being true to name.

There are two seasons in the year when citrus trees may be planted—autumn and spring. The autumn planting I would recommend for positions that are comparatively free from frosts, as the trees then get a root-hold during the winter, and will be ready to jump off with the warmth of spring. In positions less favoured by climatic conditions, the planting may well be left until the spring. To make a start with the planting, first open a hole right around the stake with a shovel or pronged hoe, leaving it slightly higher in the centre to give the roots a downward tendency. Before placing the tree in position cut back any very long or damaged roots, but without exposing the roots for any length of time. Place the tree in the hole already made, with the trunk about 3 inches from the stake and on the side opposite from whence the most severe winds come; spread out the roots into as natural positions as possible. After pulling in sufficient of the loose moist soil to cover the roots, raise the trunk of the tree two or three times to allow the earth to fall in closely around the roots, and then, holding the tree in an upright position, make the ground firm round the tree with the foot. Pull in the remainder of the earth and leave it loosely raked over.

Care should be taken not to plant the tree too deeply; leaving the old graft about an inch above the surface will be found about right. At the end of the planting make each tree secure to its stake with a piece of soft rope or stringybark, or something that will not cut the bark of the tree. At the same time cut the tree well back, as a lot of the roots will have been left in the nursery.

To deal with the cultivation of the trees I will take the month of June as starting the orchardist's work for the year. During this month I consider the first ploughing should be made, and the soil left to lie in the rough, unless the season be unusually dry, in which case it could with advantage be harrowed down. Following this, a cross-ploughing should be made and the trees chipped. All this should be completed by the end of August, so that the trees may be given every opportunity to set their crop.

As the rainfall during the spring and summer months is usually only light, I would suggest keeping an eye on moisture conservation; after each fall of rain the harrow should be run over the ground. This will be found sufficient while the ground is clean (as it now should be), and at the same time will not disturb the young roots which are feeding the tree. With the approach of warmer weather summer grass will make an appearance, but this can be kept in check by regular cultivation. A reversible disc harrow in ground comparatively free from stone will be found a most useful implement for the purpose, or in stony ground a spring-tooth harrow will do good work; but either of these tools will be found inadequate if the season is abnormally wet, and the grass obtains a firm roothold, in which case the plough will have to be resorted to. However, I am not an advocate of ploughing at all during the summer months if it can possibly be avoided.

As the seasons go round and autumn approaches I would suggest departing from intense cultivation, and allowing the ground to grow something for the trees to feed on during the following season. This end may be accomplished in various ways. Where summer grass is plentiful, I consider it a good method to let it grow after the end of February, let it come to maturity and lie on the ground for ploughing in about June or July. Of course, there is a certain amount of risk involved with this, as with any cover crop. If a green crop is to be planted, the end of February or March will be a good time to get it in. Grey field peas is one of the best crops for the purpose; it will supply an abundant growth of stuff of a kind that is easily dealt with later on.

Successful green cropping in the orchard is only practicable while the trees are small. With larger trees a better plan would be to grow the stuff elsewhere and cart it into the orchard. If you have the necessary conveniences, the three months of autumn can be most profitably spent carting on soil or bush scrapings, or other matter that will supply nourishment to the trees. It is generally recognised that the majority of holdings in this district on which citrus fruit is grown are naturally very deficient in humus, and this must be supplied in one form or another.

At the same time I do not wish to lay down hard-and-fast rules; that is quite impossible, owing to irregular climatic conditions.

DISCUSSION.—In the discussion that followed, the principal point raised was what was the proper time to plough.

Mr. ARGENT said that he preferred spring time. He had ploughed for two years in succession during June, and had left unploughed a portion of his orchard, with the result that the unploughed portion was far the better looking, the ploughed having lost all its lustre and a number of trees having actually died.

Mr. ALEX. SMITH said that in all probability the situation of the ploughed area was inclined to be damp, and that the trees being younger than those unploughed, they would feel the effects of the excessive moisture during the recent two very wet seasons.

Several members said that ploughing during winter had been to them the most profitable, as it conserved moisture and materially sweetened the soil.

Ploughing and leaving in the rough was generally approved of as being the best practice, owing to it being a safeguard against damage by heavy falls of rain during the winter months.

Regular cultivation during the summer months was also deemed the best practice.

Woonona.

A meeting of about sixty members of this branch was held on 11th June, and a discussion took place in connection with the next annual show to be held by this branch in January next.

A paper was also read by Mr. Frank Catt on the diseases affecting plants and fruit trees.

Yurrunga and Avoca.

A well-attended meeting took place on 14th June, and an interesting and instructive lecture was given to an appreciative audience by Mr. E. Breakwell, B.A., B.Sc., Agrostologist. A summary of the lecture follows:—

GRASSES AND FODDER PLANTS FOR MOSS VALE.

In considering the grasses and fodder plants suitable for Moss Vale district, one had to bear in mind that Moss Vale had an extremely long winter and mild summer. English grasses would be successful were it not for the dry summer which the district often passed through. Such well-known grasses as Rye and Timothy were most valuable if they could be grown in the more sheltered localities. Generally speaking, however, one had to look farther afield, and fortunately the Agricultural Department had a certain amount of data to work upon in this respect. Grass plots had been successfully established at the Mittagong Industrial Farm Home, and after a period of two years such grasses as *Phalaris bulbosa*, Tall Oat grass (*Avena elatior*), Cocksfoot, Giant Fescue (*Festuca arundinacea*), Kentucky Blue grass, and Chilian clover were doing very well indeed. There were certain other grasses and clovers which had not been sown there, but which, judging by the experience in localities with conditions similar to those of Moss Vale, should do well in the district. Mention might be made of Bokhara clover, *Danthonia semiannularis*, Westernwolth's Rye grass, and certain native grasses which probably required a cover crop to ensure their successful germination.

The more important grasses and fodder plants were briefly described.

Cocksfoot grass was sufficiently well known to most farmers. It required a fairly heavy sowing, or to be mixed with other grasses, such as Rye grass or Clover, to diminish its tussocky habit. As in all other grasses, the preparation of the land and the management of the pasture for the first year or two had everything to do with the success of the pasture. The land should be well cultivated and as free from weeds as possible, and care should be taken to have seed of good germinating qualities. Sowing should take place sufficiently early in the autumn to allow the grass to become established before heavy frosts set in. For the first year pasturing should be carefully regulated. If the young grass roots were cropped too heavily their seeding was seriously affected. Just enough grazing should be carried out, therefore, to allow the roots to stool as much as possible, and stock should be removed when the seeding season arrived. In subsequent years seeding should always be allowed to take place. This thickened up the pasture considerably. Once the seed was ripe the paddock could be grazed to its full capacity.

Phalaris bulbosa was one of the best winter grasses yet introduced into this State. Its powers of frost and drought resistance were remarkable, and its succulence and palatability had been proved over and over again. The grass needed careful management for the first year or two, and it should be allowed to seed to thicken up the pasture. The grass would grow on hard soils, and had a considerable stooling property.

Tall Oat grass, as grown at Glen Innes Experiment Farm, was looked on very favourably by neighbouring farmers, and judging by the way it grew at Mittagong, it should do well at Moss Vale. The leaf was most succulent, and the grass, which filled a decided want in those districts where long winters were the rule, had taken on in New Zealand to a considerable extent of late years.

Giant Fescue was rather coarse in its mature stages, but if kept short was valuable for cattle. It was very drought-resistant, and would certainly do well in Moss Vale.

Kentucky Blue was a fine cattle grass, very highly thought of in America. It required a great deal of encouragement, however, to get it to grow, because of the poor germinating qualities of the seed and the slowness of growth in the early stages. A cover crop in the form of *Phalaris bulbosa*, for example, was useful. This enabled the Kentucky Blue to be sheltered between the clumps of the larger grass, and to stool out. Once established, Kentucky Blue was a fine fighting grass in the face of drought, and after considering the value of the grass in New England he could not but think that it should be given every encouragement in Moss Vale.

Danthonia semiannularis (Wallaby or White Top grass) was a native, and probably one of the most valuable native grasses both for sheep and cattle on the Tablelands throughout the State. It grew all the year round, had a very fine leaf, was permanent when once established, and would grow on all classes of soils. The seed should be sown with a stronger growing grass to act as a covering crop.

Packets containing small quantities of seed of several of these grasses were distributed to members.

Other native grasses which were described, and the seed of which was distributed to members, were—Coolah grass (*Panicum prolutum*), Warrego Summer grass (*Panicum flavidum*), and Texas grass (*Panicum bulbosum*). These grasses did well at Bathurst, but it was impossible to say definitely how they would thrive at Moss Vale, as the winters might prove too long for them. The same remarks applied to Sudan grass, seed of which was also distributed.

Chilian clover had been most successful. It was a form of red clover, but gave a greater quantity of feed and appeared more drought-resistant. It also seemed to set its seed very well. Packets of seed were distributed for trial.

Bokhara clover was receiving a great deal of attention of late, and there was not the slightest doubt the plant would grow well in Moss Vale district. In America it was very widely grown, and was considered a most valuable dairying plant. Stock had to be forced to acquire a liking for it, and this was best done by feeding it to them when it was young. It grew slowly at first, but towards the end of the first year began to stool out and send out vigorous shoots. This was a good time to graze the plant. Although biennial in character, if allowed to drop its seed a paddock of Bokhara clover would remain indefinitely. Small packets of seed were distributed for trial.

Brief mention was also made of Westernwolth's Rye grass as a good annual hay crop, and seed of this grass was also distributed.

Orchard Notes.

AUGUST.

W. J. ALLEN.

Spraying.

WINTER spraying of all deciduous trees with lime and sulphur or Bordeaux mixture should now be well in hand. The winter applications for Curl Leaf and Rust of the peach and Shot-hole of the apricot and plum should be made at midwinter, as this has, so far as tested, given better results than the early or later spraying. In many districts the spraying of the apple and pear can follow on, but where these varieties are subject to Black Spot the spray should not be applied until the "pinking stage," or just before blossoming. Last season's experiments in the orchard at Yanco Experiment Farm again showed this midwinter application of lime-sulphur to be far more effective in controlling Peach-leaf Curl than when the application was delayed till the buds were showing pink, just before blossoming. But until the experiment has been continued long enough to show that this one early spraying is sufficient to control Peach-leaf Curl, it will be wise, where curl is expected to show itself, to follow this early spraying with a second application, at a strength of 1 to 28 (Departmental formula), when the flower buds are just showing pink, but while the petals are still tightly folded; this second spraying is necessary where Brown Rot is troublesome. If aphis are showing on the trees, a tobacco wash could be added to the lime-sulphur. Red spraying oil, applied when the trees are dormant, has, in some instances, completely protected peach trees from aphis; but sometimes the treatment is only partially successful, and unfortunately, the lime-sulphur will not "take" on the trees after an application of oil. Red oil applied to any trees that have been found to be infested with San José or Mussel Scale would probably give better results than lime-sulphur. We generally find the former more efficient in eradicating these pests.

Where red oil is used for Woolly Aphis on apple trees, spraying should be completed early in the winter, so as to permit the application of either lime-sulphur or Bordeaux mixture when fruit buds are showing pink, but while the petals are still folded tight.

Swabbing Vines.

Black Spot of grape vines was again very prevalent last season, even in districts where it is very seldom seen. It also attacked varieties of grapes that are generally considered immune. To combat this disease this season vine-growers should swab their vines with either a solution of sulphate of iron (5 lb. to 1 gallon of water, to which is added half a pint of sulphuric acid) or with 1 volume of sulphuric acid to 10 volumes of water. This dressing is applied to the main stem and permanent arms, as well as the spurs and new canes, with a brush or swab.

Brown Spot of Mandarin.

The diseased and dead wood showing in the trees should be cut out and burnt. The first application of Bordeaux mixture should be applied before the spring blossoming, either at the end of this month or early in September. Where this disease has been bad, and no treatment has hitherto been given, Bordeaux mixture, 6—4—50, should be used; but where the disease has been greatly reduced by the previous season's treatment, the Bordeaux mixture could probably be reduced to 6—4—100, or half normal summer strength.

Pruning and Ploughing.

Pruning of the late blossoming pears and apples may be continued, but an effort should be made to finish up the work as early as possible. Ploughing should be completed early this month.

Manuring of Citrus Trees.

Those who intend using quick-acting fertilisers should make the first application this month. It is better not to apply too much at one time, but rather to make two applications—one now and one after the fruit has set. Spread the fertiliser well through the rows; the outer fringe of foliage is usually a good guide as to where to commence sowing the manure. In the drier districts, where late rains are uncertain, it is better to make the application early rather than late, as they will not give good results if applied when the soil is lacking in moisture.

Regular light annual dressings of from 3 to 5 cwt. per acre should be the rule of the orchardist. In light, poor soils, where trees are in full bearing, at least 10 cwt. per acre should be applied.

Planting.

It is late for planting many varieties of stone fruits now, but apples and pears can still be planted in the colder districts, though earlier planting is to be preferred where possible, especially where the spring is likely to be a dry one. Citrus trees can be planted during the latter part of this month in the milder coast districts. In frosty situations, however, planting should be delayed till danger of late frosts is over, and warmer conditions prevail. Care should be taken that the roots are not exposed to either wind or sun during planting, nor should they be allowed to suffer subsequently from any lack of moisture. Cut the trees well back when planting, and mulch the surface with well-rotted straw or stable manure wherever possible.

Grafting.

Nursery stock can be grafted during the latter part of this month. Any older trees it is desired to work over to more suitable varieties may be grafted as soon as the sap is running and the buds begin to burst.

Harvesting.

The marketing of citrus fruits from our late districts will continue. Care should be taken not to allow Emperor Mandarins to hang too long, or they will become puffy and deteriorate in value.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
National A. and I. Assn. of Queensland (Brisbane)	J. Bain	Aug. 12–17
Trundle P. and A. Association	W. E. Herborn	,, 13, 14
Corowa P., A., and H. Society	J. D. Fraser	,, 20, 21
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 27, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 3, 4
Grenfell P., A., and H. Association	G. Cousins	,, 3, 4
Albury and Border P., A., and H. Society	W. I. Johnson	,, 3, 4, 5
Ganmain A. and P. Association	T. S. Henderson	,, 10, 11
Young P. and A. Association	T. A. Tester	,, 10, 11, 12
Cowra P., A., and H. Association	E. W. Warren	,, 17, 18
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 17, 18
Narrandera P. and A. Association	J. Faulkner	,, 17, 18
Temora P., A., H., and I. Association	A. D. Ness	,, 17, 18. 19
Burrowa P., A., and H. Association	W. Burns	,, 19, 20
Holbrook P., A., and H. Society	J. S. Stewart	,, 19, 20
Canowindra P., A., and H. Association	H. M. Brown	,, 24, 25
Henty P. and A. Society	H. L. Yates	,, 24, 25
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25
Wyalong District P., A., H., and I. Association	T. A. Smith	,, 24, 25
Yass P. and A. Association	E. A. Hickey	.. 26, 27
Narromine A. H. and P. Society	C. E. Skinner	Oct. 1, 2
Junee P., A., and I. Association	T. C. Humphreys	,, 1, 2
Ardlethan and District P. and A. Society	W. J. Nixon	,, 2
Eugowra P., A., and H. Association	R. A. Douglas	,, 2
Deniliquin P. and A. Society	P. Fagan	,, 2
Hay P. and A. Association	G. S. Camden	,, 9, 10
Tweed River A. Society (Murwillumbah)	T. M. Kennedy	Nov. 13, 14
Lismore A. and P. Society	H. Pritchard	,, 20, 21

1919.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	H. G. Fraser	Jan. 15, 16
Kiama Agricultural Society	G. A. Somerville	,, 25, 27
Dapto A. and H. Society	F. James	,, 31; Feb. 1
Shoalhaven A. and H. Association (Nowra)	H. Rauch	Feb. 13, 14
Ulladulla A. and H Association (Milton)	R. F. Cork	,, 19, 20
Yanco Irrigation Area A. Society (Leeton)	T. H. Hogan	,, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 25, 26. 27
Inverell P. and A. Association	J. T. Dale	,, 25, 26, 27
Newcastle A., H., and I. Association	E. J. Dann	,, 26, 27, 28; March 1
Tenterfield P., A., and M. Society	R. S. Smith	Mar. 4, 5, 6
Cootamundra A., P., H., and I. Association	N. Gardner	,, 11, 12
P. and A. Assn. of Central New England (Glen Innes)	G. A. Priest	,, 11, 12, 13
Goulburn A., P., and H. Society	H. C. Fraser	,, 13, 14, 15
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 18, 19, 20
Armidale and New England P., A., and H. Assocn.	A. McArthur	,, 18, 19, 20, 21
Hunter River A. and P. Association	E. H. Fountain	,, 26, 27, 28, 29
Quirindi District P., A., and H. Association	A. Pountney	April 2, 3, 4
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 9, 10
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 15–23
Moree P. and A. Society	A. U. Ezzy	May 21, 22, 23

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1918.

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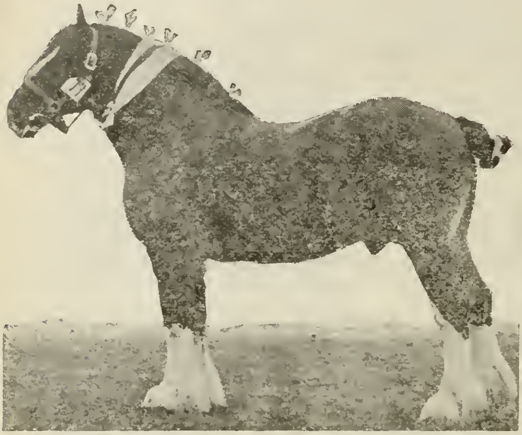

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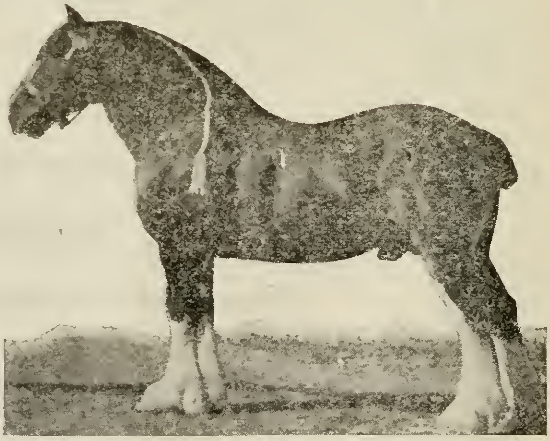

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2nd September, 1918.

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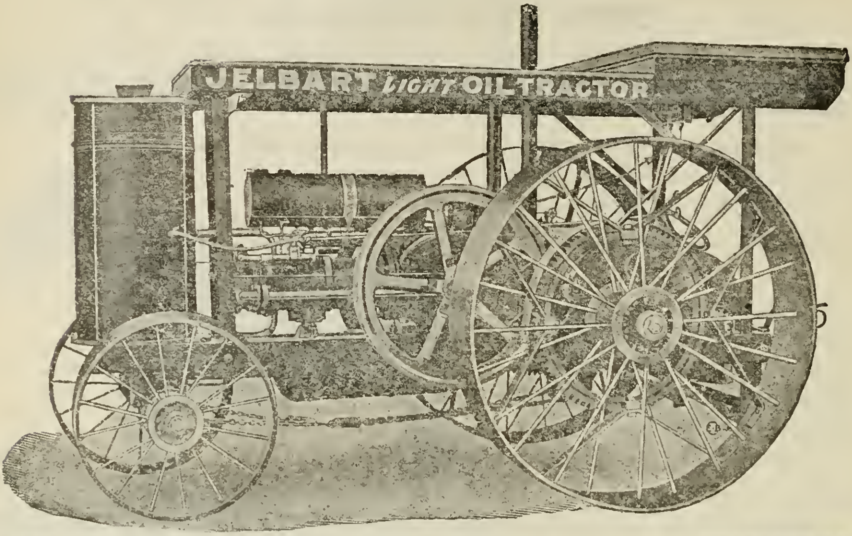

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Agricultural Gazette of New South Wales.

The Cultivation of Maize.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

PLANTING.

There are many questions concerning the sowing of maize which are of importance, inasmuch as they have some effect on the yield of the crop, and are often the subject of much controversy. Such questions as depth of sowing, time of sowing, rate of sowing (amount and distribution of seed per acre), and the method of sowing, all affect the yield more or less variously in different districts and under different conditions. A little more attention to details in sowing, unimportant as those details are thought to be, will generally repay the time and trouble. The old saying, "Well sown is half grown," applies as much to maize as to any other crop.

The Seed.

The seed should, first of all, be of good viability or germinating power. Much disappointment has been caused by planting seed which will not germinate, or which gives such a poor germination as to render a complete replanting necessary. This can always be avoided by a preliminary germination test, and such a test should certainly be made if there is any doubt about the quality of the seed.

In the United States of America, where the winters are severe, much seed maize is often seriously affected in its viability by being caught by heavy frost when it still contains a large amount of moisture. Hence it is quite a common practice there to test grains from ears selected for seed in order to discover the germinating capacity of each. Usually six grains are taken from each ear, and the germination is tested on moist rag, flannel, blotting-paper, sawdust, sand or soil. Each ear is numbered correspondingly to the position of its seed in the tester, and those ears which do not give a full germination of six vigorous seedlings are rejected. The conditions that make such a test necessary do not obtain to any extent in the maize-growing districts of New South Wales, but it may yet be found that this method of testing germination is worth undertaking in the colder parts of the Tablelands. Experiments are in progress to determine whether the practice should be recommended to farmers in those districts.

In other recognised maize centres (especially on the coast) failure to germinate as a result of deficiency in the seed is more largely caused by mould and insect damage, the effects of which are more easily seen than frost damage.

Injury to the germ may also be the result of over-fumigation or of fumigating while the grain is moist. It will usually be found that maize damaged by grain moth will give a better germination than grain damaged by weevil; and where grain affected by the former insect alone has a special seed value, it can often be planted with quite satisfactory results by determining the percentage of germination and planting more thickly accordingly.

Other things being equal, good plump seed is preferable, but it will sometimes happen that acclimatised seed, or seed that has been specially bred, may not be as plump as is desirable, but yet be more valuable than plump seed which is not acclimatised or which has no breeding behind it.

For planting with a maize drill, it is important to have seed that is well graded, especially as to size. Where the smaller grain from the tip of the ears and the larger grain of irregular shape from the butt are included a uniform planting cannot be made. Where a thick plate is being used and three grains are being sown at every drop, the inclusion of tip and butt grains will mean the frequent dropping of one or two butt grains or of five or six tip grains instead of the usual three. Any maize-grower of experience knows that this causes a reduction in yield on account of the production of several nubbins or barren stalks in the hills that are sown too thickly, and one or two ears on the single-stalk hills; in both cases the yield is below that of a normal three-stalk hill. For this reason, it is advisable to discard the tip and butt seed of selected seed ears when sowing with a maize drill. For the same reason, the seed ears should be graded as well as possible as to uniformity in size of grain.

Methods of Sowing.

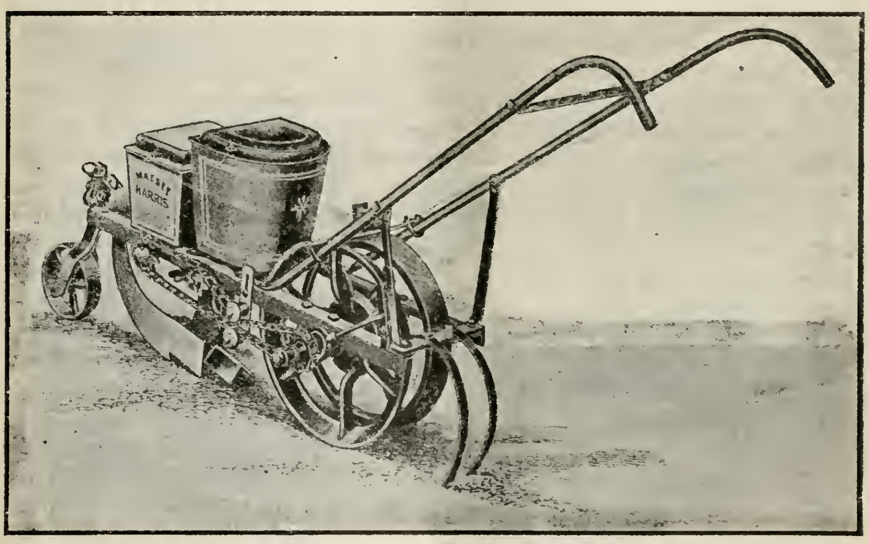
1. *Broadcasting.*—Many farmers on the South Coast still have their crop of "broadcast" maize for green fodder or silage. This method of sowing maize is not recommended except under special conditions, such as on land of irregular shape (*e.g.*, edges of creek and river banks), and on newly-broken paspalum or couch sod, where cultivation is difficult. Maize sown in drills not only yields more nutritious fodder, but is much easier to harvest.

2. *Ploughing-in.*—This is not a very objectionable method when the ground is in good order. The seed is usually dropped by hand during a light skim or surface ploughing with a four- or six-furrow plough, the covering of the seed in the last furrow being accomplished with the succeeding round of the plough. It is a system mostly adopted in wheat-growing districts where multiple ploughs are used on the farm, and where large areas of maize are also grown, as in the case of Inverell and Glen Innes. There is some danger of covering the seed too deeply in cold, heavy ground, especially with an early planting. The soil must be moist enough to induce ready germination, and in the case of a clay soil a loose covering on the seed is rather an advantage. The seed can be dropped by hand as accurately as with a maize drill, if care is exercised and if one is practised, but irregular stands are too often seen as a result of slovenly dropping. Often, too, the ploughing to be given at planting time is made an excuse for insufficiently preparing the ground beforehand. Where this occurs the method is to be deprecated.

On small areas, where hand-planting is justifiable, a single-furrow plough is used to open the furrows and the seed is covered by the return of the plough.

Ploughing-in is not so objectionable in the case of late planting when a deeper covering is essential, owing to the hot weather prevailing and the necessity of getting the seed down to moisture, and for conserving sufficient moisture there until germination is effected. This can be better ensured if the land is somewhat dry by rolling after ploughing-in, and following the rolling immediately with a harrowing.

3. *Sowing with a Wheat Drill.*—The sowing of maize with a wheat drill for a grain crop cannot under any circumstances be recommended. It covers the ground quickly, but that is as much as can be said in its favour. Not only is it a matter of some difficulty to get a seeding light enough for a grain crop in most districts where there is a wheat drill on the farm, but it gives a very irregular stand. It is no uncommon thing to see six or eight plants spring up in one place, especially where the grain is small, and often large spaces will be left in the rows with no plants at all. Good yields have often been sacrificed by this method of planting. The wheat drill works better with large grain than with small grain, but it is never so satisfactory as where an accurate and regular dropping is made, such as can be obtained with a maize drill.



Single-row Maize Drill, with Fertiliser attachment.

For green fodder or silage the use of the wheat drill is not so objectionable. If all but three tubes of a fifteen-tube drill are stopped by cardboard or a piece of tin the rows may be made about 32 inches apart, which is about the desirable width for the purpose.

4. *Sowing with a Maize Drill.*—Not only can a uniform, regular drop be secured by using a maize drill, but the depth of planting can be regulated by raising or lowering the wheel in front of the drill, and fertiliser can be applied in the furrow at the same time from a box which can be attached to most of the latest types of drill.

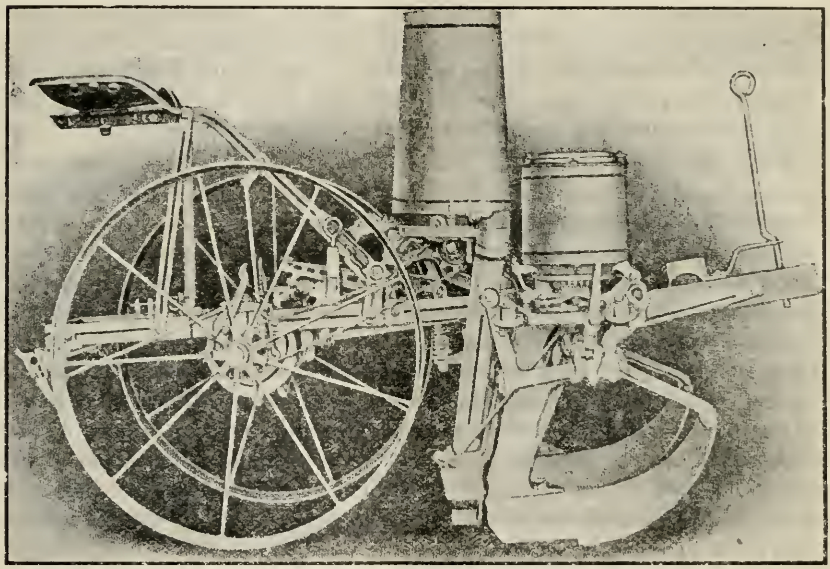
The single-row maize drill is the one mostly used, but the two-row drills are gradually winning their way on those farms where large areas are sown, either for grain or for fodder.

Most of the drills are provided with a curved runner in front of the planting tube, which carves its way through the soil and allows the bottom of the tube to go beneath the surface. Many maize-growers work the drill without the front wheel, which regulates the depth of sowing; but more care should be exercised, when an early sowing is given, to so regulate the depth of sowing by the use of this wheel that the seed is not planted too deeply in cold moist soil, which is unfavourable for germination. A furrowing attachment can be obtained to precede the runner where it is desired to plant in a furrow in order to get down to moisture, or to push aside clods or trash (undecayed stalks, weeds, or grass) in order to prevent the drill riding out and depositing the grain on the surface. This furrow-opener may be in the form of a pair of small double discs set at an angle, or of small double mouldboard sweeps.

The double-row planters are generally fitted with a disc at the end of a long rigid bar, which can be swung over from side to side to mark out the next row. A similar scribe or marking attachment on the single-row planters is often unsatisfactory, owing to the lighter weight and less stability of the machine, which prevents it from being sufficiently rigid to draw a straight line. With some makes of machine there is supplied an attachment consisting of a bar which goes across the front of the drill and has a wheel on each end. This largely prevents the drill from swaying about when in action. Some growers overcome the trouble by a home-made device in the shape of two wedge-shaped boards bolted to the runner. On the whole, the heavier the machine the less trouble there is from this source. A board, twice as long as the distance between the rows, fixed to the swingle-bar, and with a short heavy piece of chain on each end, is an excellent method of marking the next row during the drilling operation.

The seed-box is fitted with a removable plate-cover, which exposes the plates, so that they can be altered as desired. Two standard sizes of plates are usually made—thick and thin. When a thin plate is used a "dummy" must also be first inserted to bring the combined thickness of the two up to that of the thick plate. When a thick plate is used, the dummy plate should be removed. There is often trouble in the cracking of grain where the thin plate is used; this is due to too much play between the dummy and the bottom of the box. It is mostly met with when small grain is being sown, and especially when sowing broom millet seed. It can be entirely obviated by evenly distributing some thin packing under the dummy plate before inserting it. After the plates and cover are inserted, the screw which keeps the cover down (usually a thumb-screw) should not be turned so tightly as to prevent the plate from revolving freely. The plates have the holes bevelled to a greater diameter on the lower side, so that the grain will fall freely when the hole comes over the dropping tube. A small hammer or trigger passes over the top of the plate at the back of the seed-box, in order to dislodge any grains which may become caught or wedged tightly in the hole.

The fertiliser-box is attached to the frame behind the seed-box, and is fitted with a separate tube down which the fertiliser passes. Sometimes a spreader is fixed at the bottom of the tube for the purpose of spreading the fertiliser on each side of the seed, and to prevent it from coming in contact with it and spoiling its germinating power. This injury sometimes happens with a badly-made superphosphate or with bone-dust and dried blood; but the spreader has one decided objection, viz., it distributes the fertiliser at a higher level in the soil than the seed, and encourages the roots of the young plant to come up to it rather than to strike downwards. The machine that will distribute the fertiliser at a lower depth in the soil than the seed is the most desirable. The size of the opening through which the star-feed in the fertiliser-box pushes the fertiliser can be altered by a regulator attached to the front of the box. The rate at which the fertiliser is applied can be further increased by using a smaller sprocket wheel on the corresponding axle. This sprocket wheel runs in the reverse direction to that of the seed-box sprocket wheel, and the bottom of the pulley or drive chain must be passed over the top of it.



Double-row Maize Planter, with Fertiliser attachment.

A foot or hand clutch throws either both the fertiliser and seed sprocket wheels, or each singly, out of gear.

The best type of covering or firming wheel is a heavy, divided, concave wheel, which firms the soil at each upper side of the seed, and leaves a strip of loose open soil for the young seedling to push through.

The single-row planter only requires a single horse, and up to 7 acres can be planted in a day. The double-row drills will plant twice as much.

Adjusting the Maize Drill.

There are two kinds of plates in use for sowing maize, viz.:—(1) Edge-selection plates, in which the holes to receive the grain are situated at the outside edge or rim of the plate, and in which the holes are made to take single grains only on their edge, being of such size and shape that not more than one grain is admitted at a time; and (2) round-hole plates, in which the holes are in the centre of the plate. The edge-selection plates, which are generally considered to be more accurate than the round-hole plates, especially with graded seed, are usually seen in double-row planters; and for check-planting or sowing on the square or in hills, a cumulative drop is made until three or four grains have collected in the tube, when the knot in the check-wire trips the planting device and allows the seeds to drop.

With the single-row drills, however, the round-hole plates are mostly supplied, and with most machines these are made in thick and thin plates, with five or ten holes in each plate. Additional plates can always be made with holes of any diameter, in order to suit the requirements of the grower. It is important that each grower should obtain the size of hole in the plate or plates that he finds suits him best for the way he wishes to plant and the variety he is growing, which largely determines the size of grain. A thin plate, as a rule, will only take single kernels of a medium or large grained variety, but it may take two grains of a small maize. Where it is desired to plant two or three kernels of a medium or large grained variety, or three or four grains of a small maize, a thick plate must be used. If an average sample of seed is sent to any of the machinery firms from which a maize drill is purchased, plates will be sent with holes bored to such diameter as will plant in the manner desired.

With a familiar make of single-row maize drill, four sprocket wheels of six, nine, ten, and thirteen teeth respectively are supplied. With ten-hole and five-hole plates the following are the approximate distances apart of the seed in the row, according to the sprocket wheel used:—

Plate.	Sprocket Wheel.	Approximate Distance of Planting.
10-hole	6 teeth.	10 inches.
,,	9 ,,	14 ,,
,,	10 ,,	16 ,,
,,	13 ,,	20 ,,
5-hole	6 ,,	20 ,,
,,	9 ,,	28 ,,
,,	10 ,,	32 ,,
,,	13 ,,	40 ,,

Single Grains *versus* "Hill" Planting.

The question whether it is better to sow single grains in the drill, or two or three grains together at twice or three times the distance apart, or in the "hill," as it is termed (although actually no hill of earth is made), is the subject of much controversy, and it is doubtful whether it is worth so much discussion after all. On theoretical grounds it might be argued that when single grains are planted each seedling has free space in which to develop into a vigorous plant; but this condition cannot last for long, as the roots of neighbouring plants are soon intermingled and competing for the same moisture and plant-food material. It has been observed, however, that on rich land, where maize suckers freely or where the variety is in some degree prone to sucker, the hill planting of three or more grains to a large extent keeps this sucker-formation down, whereas the sowing of single grains results in the development of a large number of suckers.

In most cases where the two methods have been tested by actual experiment, and where the number of plants per acre was approximately equal, there was found to be little difference in yield.

Owing to the tendency toward development of suckers when single grains are sown, this method is to be preferred when the crop is to be used for fodder purposes.

"Check" Planting.

The practice of "check" planting, or of sowing in hills "on the square," so that straight rows run both down and across the field, is sometimes advisable, so that cultivation can be done in two directions. This will be found to be an advantage, especially on old, weedy ground. On small areas the planting in this way is generally done by hand, after marking out the field in two directions at right angles, three or four grains being sown at the intersections of the furrows. It should be remembered that in the case of small fields, where cultivation is done both ways, there will be much waste in headlands. If cultivation is not done in two directions there is no advantage in check planting over hill planting. Cultivation both ways is an advantage, especially in the control of weeds in the rows, which are always the most difficult to deal with.

Check planting cannot be done with the ordinary maize drill by starting off at each end level with the preceding row; it requires a checking attachment, which consists of a wire chain knotted at regular intervals of about 3½ feet. The dropping device is not opened until pushed aside by a knot on this chain, which is fixed at the end of the field, and which passes through the planter as it travels along. The first hill in each row should be started in line with that of the preceding row, and if the field is not unevenly sloping or undulating, the hills will be sown in checks or "on the square." The use of the check planter is impossible where stumps, dead trees, or other obstructions are present in the field.

Rate of Seeding.

The rate of seeding is determined by several factors, the chief of which are—(1) climate and season, (2) soil (fertility and texture), (3) variety of maize grown, (4) quality of seed (soundness and viability), and (5) methods of cultivation.

As a general rule, where the rainfall is greatest the largest number of plants may be grown to the acre. For instance, on soils of similar fertility a greater rate of seeding can be given on the North Coast, where a certain measure of rainfall is assured during the growing season, than on the Western slopes, where the summer rainfall is uncertain, and where the evaporation is greater on account of a drier atmosphere. The season cannot be foretold in any district with any accuracy; but on the North Coast, where the planting season extends over four months, the spring and early summer are usually much drier than the late summer and autumn. This fact justifies a heavier seeding with a late sowing than with an early one in the same district and on the same soil.

The richer the soil the greater can be the number of plants per acre. Even on the same farm marked differences in the fertility of the soil may occur, owing to different formation or to long-continued cropping, which would justify the use of different rates of seeding. Record yields of over 200 bushels per acre have been authentically made in America on small plots. These yields are only possible on very heavily fertilised soil and with a very thick stand. Where the soil is not in good condition at planting time a heavier seeding must be given in order to get the required stand, on account of the poorer germination to be expected.

The habit of growth of the variety largely determines the rate of seeding. Early maturing varieties of comparatively short growth can be sown more thickly (other things being equal) than late-maturing, tall-growing varieties. Even on rich soil there appears to be a limit to the rate of seeding with large late varieties, on account of the danger of depriving the growing cobs of the sunlight they need.

It cannot be laid down as a general rule that small-grained varieties should be planted thickly or large-grained varieties thinly, although it might be true in many cases. Hickory King, for example, is one of the largest-grained varieties in existence. It is not, however, a late variety with a heavy, tall growth of stalk, nor does it bear large ears. It should, therefore, be planted fairly thickly, in order to get the best results, when it is grown on good soils.

A germination test previous to sowing will disclose the percentage of sound and viable seed, and will enable the planting to be done in such a manner as to get the requisite stand.

Better methods of cultivation to conserve moisture and to render more plant-food material available will also enable an acre of land to carry a larger number of stalks.

Although it is agreed that it is impossible to foretell the exact rate of seeding which will give the best results in any particular season, there should be for a given district, soil, variety, time of sowing, &c., an approximate rate which will do best over a considerable period. This can only be determined by experimenting for a number of years in all localities where the conditions are markedly different. For the present only a general approximation can be given, and this is better expressed in terms of the distance between the rows and between the plants or hills in the rows, or by the number of plants per acre, than by the weight of seed per acre.

The following table will show the relation between the approximate number of plants per acre and the distance between the plants:—

Average Distance between the Plants.	Distance between the Rows.					
	3 feet.	3½ feet.	4 feet	4½ feet.	5 feet.	6 feet.
6 inches ...	29,000	24,900	21,800	19,400	17,400	14,500
7 ,, ...	24,900	21,300	18,700	15,600	14,900	12,450
8 ,, ...	21,800	18,700	16,300	14,500	13,100	10,900
9 ,, ...	19,400	16,600	14,500	12,900	11,600	9,700
10 ,, ...	17,400	14,900	13,100	11,600	10,500	8,700
11 ,, ...	15,800	13,600	11,900	10,600	9,500	7,900
12 ,, ...	14,500	12,400	10,900	9,700	8,700	7,250
13 ,, ...	13,400	11,500	10,000	8,900	8,000	6,700
14 ,, ...	12,400	10,700	9,300	8,300	7,500	6,200
15 ,, ...	11,600	10,000	8,700	7,700	6,900	5,800
16 ,, ...	10,900	9,300	8,200	7,300	6,300	5,450
18 ,, ...	9,700	8,300	7,300	6,500	5,800	4,850
24 ,, ...	7,300	6,200	5,400	4,800	4,400	3,650

A study of this table will show that with rows 4 feet apart and three grains sown every 30 inches apart in the rows (*i.e.*, equivalent to single grains every 10 inches), there will be approximately 13,100 plants to the acre.

Under good conditions on the coast early varieties of maize with small ears may be sown at the rate of 12,000 to 16,000 plants per acre. Rate of seeding experiments carried out with the variety Leaming at Grafton Experiment Farm, during 1915 and 1916, show that for yields of about 60 bushels per acre a stand of about 16,000 plants per acre has given the best results. With rows 4 feet apart, this means an average of three grains every 24 inches apart in the rows. With late varieties from 8,000 to 12,000 plants per acre should be sufficient.

On the Northern Tableland, where much lighter crops are expected, and where early, small-eared varieties must be grown, from 8,000 to 12,000 plants per acre will be ample.

In the Inverell district, where the soil is rich, but where the rainfall is uncertain, a light seeding of about 8,000 plants per acre will probably give the best results over a series of years.

In the Tumut district, where the main varieties are large eared, the seeding should be on the light side—from 8,000 to 10,000 plants per acre.

In the drier districts of uncertain rainfall, where only poor yields are expected, about 3,000 or 4,000 plants per acre will give the best yields on the average.

The foregoing figures refer only to maize for grain. It is being recognised of late that the growing of maize for grain and for fodder are entirely different propositions, which demand different methods of treatment for the best results. The best yields from fodder maize will be obtained from stands two or three times as thick as those given for grain in the different districts.

The seeding for grain should always be a little thicker than the desired stand, to allow for damage from insects, insufficiently prepared ground, poor seed, damage by cultivation, &c. Even with good seed and other conditions, there is usually a loss of about 5 to 10 per cent. in the final stand.

The foregoing table will also give the approximate weight of seed required for any given rate of seeding when the variety is known or the sample of seed is at hand. The different varieties of maize range from about 800 to 1,600 grains per pound weight, according largely to size of grain. The number of plants per acre divided by the number of grains per pound gives the weight of grain required to sow an acre.

In addition to estimating the yield from any rate of seeding experiments, the extra cost of harvesting and husking a larger number of small ears is a factor to be considered. With the higher rates of seeding there is also a lower percentage of saleable grain, and also a lower percentage of good seed ears. Where special attention is given to the distribution of seed maize, the rate of seeding should be less than that required for optimum yields.

Width between Rows.

Apart from considerations of the rate of seeding, it is believed that in many cases the distance between the rows could be widened with better effect. On some parts of the coast (particularly on the North Coast) where late varieties are grown, the stalks reach a height of 15 or 16 feet or more, and with close rows a considerable amount of shading of the developing cobs takes place, which is detrimental to their growth. Under these circumstances a distance of at least 4½ or 5 feet would give better results, by enabling the growing cobs to receive the benefit of the sunlight which they require. It is thought, also, that wider rows will, in a measure, enable the maize crops on the coast to better resist the leaf blight (*Helminthosporium*) disease, which is most prevalent during seasons when the amount of sunlight during the growth of the crop is below normal.

In districts like Inverell, where the soil is rich, but where the rainfall is uncertain, maize is usually grown in 5-foot rows, and makes a more certain crop in dry years.

On the wheat soils of the Western Slopes, where not more than 30-bushel crops of maize are grown in the best seasons, and where failures result in dry years with the ordinary planting in 3½ or 4 foot rows, it is thought that 7 or 8-foot rows will ensure the production of some grain in the years of low rainfall, and will not be far behind the yield of maize planted in close rows in favourable seasons. In 3½-foot rows, the roots occupy the whole of the ground before the cobs start to form, while in rows 7 or 8 feet apart the roots do not reach the middles until after the cobs have formed. The moisture in the soil between the rows is thus kept in reserve until the later stages of growth. By this wide-row system of planting, the yields during dry years in the semi-arid maize-growing districts of America are said to have been raised from 2 or 3 bushels to 16 or 17 bushels per acre. Experiments are in progress to determine the value of this wide-row planting under our conditions. The weeds along the drills are the most difficult to control, and the wide rows have an advantage in this respect, that there are not so many drills to keep clean. The success of the method depends, of course, on the space between the rows being kept free from weeds, and having its moisture conserved by cultivation. It is claimed by some that the stand in the wide rows should be thicker than in the ordinary rows, so that the plants should compete for the near-by moisture and be prevented from making too rapid and tender a growth. This point is also being investigated in our experiments.

For green fodder, the distance between the rows should not be more than 2½ or 3 feet—sufficient for a cultivator to work between.

Depth of Planting.

The depth of planting should be determined by three factors, viz., (1) time of planting, (2) nature of the soil, and (3) moisture in the soil.

In the early spring the soil is usually sufficiently moist near the surface not to require deep planting. At this time, too, deep planting results in much loss in germination, owing to the soil not being warm to any depth. The result is that there is not sufficient warmth to induce germination, and the seed rots in the ground.

Clay soils remain cold much longer than sandy soils; so that apart from the fact that the young shoots are too tender to push their way through too great a depth of clay soil, whereas they can go through a sandy soil with comparative ease, planting may be deeper on the latter than on the former. On sandy soils, however, there should be a limit to the depth of planting, for if the seed be sown too deeply the young plant not only takes a long time to reach the surface, but has expended much of the energy and reserve food material contained in the seed in doing so, and is unable to compete successfully with weeds in the vicinity which have obtained an earlier start. The young plants should come quickly and vigorously from germination, so that they can force themselves quickly ahead of the weeds in the row, in order that cultivation may be given to destroy these weeds without injury to the more vigorous maize seedlings. This cannot be effected if the planting is done too deeply.

With summer planting the depth is regulated more largely by moisture considerations. It is found that deeper planting must be resorted to at this time of the year in order to get the seed in contact with moisture, which, in spite of the rapid evaporation that goes on at this season, will remain long enough at that depth to effect germination.

No definite depth of planting can therefore be recommended under these various conditions, but from 1½ to 4 or 5 inches should be sufficient to meet most requirements.

The depth of planting should be as uniform as possible, in order to induce even and regular germination, which makes for greater uniformity in flowering, and consequently for fewer barren stalks and badly-filled cobs.

The fallacy of planting deeply to get deep rooting is easily seen when the root development of the maize plant is observed. The primary roots which develop from the seed are of comparative insignificance, and soon wither on the development of the main secondary roots, which always arise from a point an inch or two below the surface of the ground, whatever depth the seed is sown.

Listing.

"Listing" is a method of sowing practised in the drier States of America. It is mainly adopted when there exists a layer of surface soil which has dried to a depth of 4 or 5 inches, and where the ordinary methods of sowing would be useless. The "lister" drill is an ordinary drill fitted with a double mouldboard plough, which opens a furrow 4 or 5 inches deep in front of the drill. The seed is sown in the moist soil in this furrow at a depth of about 2 inches, and is covered in the same way as by the ordinary drill. By this method maize can be planted directly in wheat stubble land without any previous preparation. The method should be applicable to our western soils with a December sowing following the harvesting of the wheat. Economy in the preparation of the soil has already been strongly deprecated, but the risky nature of the crop in the districts referred to may perhaps be regarded as justifying a departure from the proper but more costly method. It is well known that a wheat crop leaves the stubble land comparatively free from weeds; and it is claimed, in the States of America where "listing" is practised, that listed corn can also be cultivated and kept free from weeds much more easily than surface-planted corn.

Planting in Furrows *versus* Surface Planting.

The use of the furrow-opener in front of the maize drill is becoming more extensive on the alluvial soils of the North Coast for several reasons. It is found to be distinctly serviceable on land that contains much undecomposed organic matter, such as old maize stalks, grass, or weeds, by pushing these aside and allowing the grain to be sown at a uniform depth. Where the ground is trashy or cloddy the absence of the furrow-opener compels the drill to ride over the obstructions, and to deposit a lot of grain on the surface of the ground, where it is easily picked up by birds, or where it lies without germinating until the next good rain or probably altogether. The furrow-opener, which consists of a pair of discs set at an angle and close together in front, or a pair of double mouldboard sweeps, is also an advantage in marking the rows that have been drilled and in steadying the single-row drill, which is easily put out of balance. The weeds in the row can be more easily covered by early cultivation, which fills in the furrows; and, where nut-grass is troublesome, this method of planting has come to be almost essential for this reason. Harrowing the growing crop can also be done with less injury to the young maize plants, and it is claimed that the stalks stand up better against lodging by wind.

The use of the furrow-opener is, however, objectionable on cold, heavy soils, especially in early spring, where the rainfall is likely to be heavy. Where the soil is cold and moist on flat land there is a danger of water lying in the furrows and drowning out the young maize. This objection has been sufficient to favour surface planting on the Hunter River and other soils of a heavy, silty nature, especially for early sowings. On hill slopes there would also be some danger in the use of the furrow-opener unless the drills were run in the direction of the contour lines.

No definite data as to the comparative values of the two systems is available from experiments in this State, but a four-years' average in Kansas* gives an increased yield of 4·1 bushels per acre in favour of furrow planting.

On flat land which is inclined to be very wet, planting on a ridge, which is made either by ploughing or by discing, will probably be an advantage.

Time of Sowing.

The range of climate in the different maize-growing areas of this State is so wide that each district differs greatly from others in the time at which maize may be sown. Climate (*i.e.*, temperature, frosts, and rainfall) plays a large part in determining the period and the time for sowing, and the variety of maize (or rather its maturing period) is also an important consideration.

On the far North Coast, particularly on the Clarence River, the sowing of small areas with early varieties usually begins early in August. This maize is ripe by Christmas, and the surplus above immediate farm requirements is usually sent on to the market soon afterwards in order to catch the better prices which generally exist about that time. Owing to infestation by weevil being common at that time, all this early maize, which is often a light crop, because of the dry spring usually experienced, must be disposed of as soon as possible. Early-maturing and late or main crops continue to be sown during September, October, and November, but after this month early varieties never seem to yield well, and appear to be easily susceptible to attacks of leaf blight, which are conspicuous in wet, cool seasons, and which reduce the yield considerably. During December late varieties continue to be sown and can usually be depended on to do well. Good crops of late varieties have often been obtained from January sowings, but they are more risky, as frosts sometimes occur in May. For fodder, sowings may be made as late as February.

On the lower North Coast (including the Macleay and Manning Rivers) maize-planting usually starts in September. Most of the sowing is done during this month and in October, owing to the danger of later sowings being attacked by leaf blight in wet seasons. The Macleay and Manning Rivers soils are, on the whole, richer in humus than the Clarence River soils, and the September and October sowings are not so easily affected by dry weather as they are on the Clarence River. Later sowings should be made with blight-resistant varieties. Green fodder may be sown until January.

On the central coast (Hawkesbury and Hunter Rivers) sowing starts early in September, and is largely completed by October or early November.

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* Kansas Agr. Exp. Sta. Bulletin 205 (1915).

Here, again, later plantings of varieties susceptible to leaf blight are liable to suffer from the disease or to be cut by frosts, which sometimes come early in April.

On the South Coast, early in October is the most favoured time. Sowing for grain may, however, be continued during November. Green fodder maize can be sown in December.

On the coast, where the safe planting season extends from two months in the south to five months in the north, as just stated, it may be laid down as a general rule that *early varieties should be sown early,* and that late varieties may be sown during the whole of this planting season. Early varieties seldom do well when planted late, notwithstanding that there may be sufficient time for them to mature. Experience has been that it is better to plant late varieties even late in the season, and to run the risk of frosts, the first few of which are mostly light in these districts, rather than sow early varieties, which are susceptible to leaf blight.

On the Northern Tablelands the first or second week in October is when the bulk of the planting is done. November sowings are risky, except for fodder or silage. Maize sown in December is often caught by frosts near the end of March or beginning of April, before the growth has reached its best development for silage.

On the Central Tableland, from the middle to the end of October is the usual time for sowing.

On the Southern Tableland maize is mostly grown for fodder, and sowing usually takes place about the end of October or early in November.

In the Inverell district, from the middle to the end of October is the most favoured time of planting for grain. If sowing is delayed until November, very early varieties are usually grown.

In the hot, dry districts of the North-west and Western Slopes the growing season is fairly long, and fairly good crops are produced when the season is favourable, which is when the rainfall is abundant. These seasons do not occur very often—perhaps, on an average, nor more than once in six or seven years. In dry seasons the crop is almost a complete failure, the hot, dry winds withering the pollen and preventing the fertilisation of the silks. The chances of having a greater humidity in the air and sufficient warmth are increased by making a very early or a very late planting of an early-maturing variety. The early sowing should be made even before the danger of frost is over. Good crops of maize have often been produced from sowings blackened partly or completely by frost when the plants were several inches high. Loss from spring frosts is less than that from summer droughts or autumn frosts. In these districts, then, although an October sowing of a late variety will probably yield best in a favourable season, the best average results will be obtained by sowing early varieties early in September and early in December. Maize for fodder or silage may be sown from September to December.

On the Murrumbidgee Irrigation Area, which has similar climatic conditions to those just described, the early-sown crops have not been very successful to date, and December plantings are recommended for grain.

In the Tumut district maize is usually sown during the latter half of October.

In sowing special seed plots which it is desired to keep free from cross-fertilisation by other maize, a period of at least three or four weeks should be allowed to elapse before or after the planting of any other maize within a distance of at least a quarter of a mile. On the North Coast it is desirable to plant the seed plot late in order to avoid trouble with weevils, which badly infest early-sown maize in the field, while later plantings remain comparatively free.

Thinning and Replanting.

In spite of all precautions it may be found that the stand is much below that desired. The chief causes of this condition are faulty seed, improper soil conditions (tilth and moisture), burrowing animals, birds eating the seed or pulling up young plants (*e.g.*, crows), improper planting, and strong fertiliser in contact with seed.

The question then arises whether the missing hills or grains should be resown, or whether the whole field should be replanted. Very little success has been gained by replanting missing hills in the maize crop. In the first place, the "refills" are two or three weeks later in flowering than the original field of maize, and they therefore suffer considerably from lack of fertilisation. The result is that many of these stalks are barren, and only a few of the ears are even moderately filled with grain. This can be obviated to some extent by planting a much earlier variety in the missing hills; but in any case the "refills" are usually dwarfed in growth, owing to their being shaded and robbed of plant-food material and moisture by their more vigorous neighbours, and they rarely produce ears of any size or sufficient extra grain to compensate for the trouble of replanting, which is a slow process that must be done by hand. The objection to planting an earlier variety is, of course, that the seed of both is rendered impure by crossing. If the actual stand is less than about three-quarters the required stand, it will be advisable to replant the entire field at once. This can be done by drilling the fresh rows in the same direction and between the old rows, getting rid of the latter by the usual cultivation.

On small areas the practice of planting thickly and thinning to the required stand is one that can be confidently recommended. It affords an opportunity of practising a very efficient method of selection, viz., that of retaining only the most vigorous young plants, while the weak plants are eliminated by their removal. No indication is given by the grain which is going to produce the most vigorous stalks; and when the weak stalks are eliminated in this way, and only the strong ones are left, the effect is shown in the subsequent yield. The thinning may be done at any time when the plants are from 6 to 18 inches tall, and a man or a boy can do about 2 acres a day. In Ohio* a four-years' average has given an increased yield of 8½ bushels per acre in favour of thick planting and thinning to the normal stand.

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* Ohio Agr. Exp. Station Bulletin 282 (1915).

Varieties of Maize for Grain and Green Fodder.

RECOMMENDATIONS BY THE DEPARTMENT OF AGRICULTURE.

AT a conference of Inspectors of Agriculture, held recently in Sydney, it was decided to make the following recommendations in connection with the growing of maize in the State :—

Classification of Maize Districts.

The maize districts for the purpose of these recommendations were classified as follows :—

1. North Coast, comprising the Tweed, Richmond, Clarence, Bellinger, Macleay, Hastings and Manning River districts, and the Dorrigo and Comboyne Tablelands.
2. Central Coast, comprising the County of Cumberland and the Hunter and Hawkesbury River districts.
3. South Coast, comprising the Illawarra, Shoalhaven, Milton, Moruya, and Bega districts.
4. Northern Tableland, comprising the Tenterfield, Glen Innes, and Armidale districts.
5. Central Tableland, comprising the Bathurst district.
6. Southern Tableland, comprising Moss Vale, Goulburn, and Mittagong.
7. North-western Slopes, comprising Inverell and Tamworth districts.
8. Western Slopes, comprising the Molong, Manildra, Mudgee, and Canowindra districts.
9. Tumut district.
10. Murrumbidgee Irrigation Area.

Order of Maturity.

The following is the approximate order of maturity of the varieties of maize recommended by the Department :—

Very Early ...	Canada Early Flint.
Early	Early Yellow Dent.
Medium Early	Silvermine. Funk's Yellow Dent. Golden Superb. Small Red Hogan. Hickory King.
Mid-season ...	Boone County White. Leaming. Early Clarence. Giant White. Golden Beauty. Golden Nugget.
Medium Late .	Improved Yellow Dent.
Late	Red Hogan.

Varieties Recommended for Districts.

North Coast.

For Grain—

Leaming—most suitable for early sowing (September to November).

Golden Superb—for early sowing on the Macleay River.

Giant White—for early sowing, Macleay and Manning Rivers, on soils of moderate fertility.

Improved Yellow Dent } Blight-resistant varieties; for later sowing
Golden Nugget } or main crop.

Leaming—for Dorrigo and Comboyne Tablelands.

Golden Beauty—for early sowing on Manning River.

Small Red Hogan—for Dorrigo only.

Hickory King—for poorer or upland soils.

For Green Fodder—

Improved Yellow Dent.

Central Coast.

For Grain—

Leaming—for early crop (September and October sowing).

Improved Yellow Dent } Blight-resistant varieties for main crop
Golden Nugget } (October and November sowing).

Red Hogan—for main crop (September and October sowing).

Hickory King—for poorer or upland soils.

For Green Fodder—

Improved Yellow Dent.

South Coast.

For Grain—

Funk's Yellow Dent
Hickory King } for early crop (September to November sowing).
Silvermine

Boone County White
Leaming
Improved Yellow Dent } for main crop (October sowing).
Red Hogan

Boone County White—for rich soils or for low moist situations.

Hickory King—for poorer or upland soils.

For Green Fodder—

Improved Yellow Dent—for fertile soils.

Hickory King—for poorer or upland soils.

Northern Tableland.

For Grain—

Early Yellow Dent.

For Green Fodder—

Leaming
Hickory King } for early sowing.

Early Yellow Dent—for late sowing.

Central Tableland.

For Grain—
Funk's Yellow Dent.
Silvermine.
For Green Fodder—
Leaming.
Hickory King.

Southern Tableland.

For Grain—
Canada Early Flint.
For Green Fodder—
Leaming
Hickory King } for early maturing crop.
Improved Yellow Dent—for late maturing crop.

North-western Slopes.

For Grain—
Funk's Yellow Dent—for October or November sowing.
Early Yellow Dent—for December sowing (only if necessary).
For Green Fodder—
Improved Yellow Dent.

Western Slopes.

For Grain—
Early Yellow Dent
Funk's Yellow Dent
Silvermine } September or December sowings recommended on upland soils.
For Green Fodder—
Leaming.
Improved Yellow Dent.

Tumut District.

For Grain—
Early Clarence.
Funk's Yellow Dent.
Leaming.
For Green Fodder—
Improved Yellow Dent.

Murrumbidgee Irrigation Area.

For Grain—
Silvermine
Funk's Yellow Dent } December sowing recommended.
For Green Fodder—
Improved Yellow Dent.

Varieties for Further Trial.

The following varieties are being further tested by the Department:—

Gold Standard Leaming.
Goldmine.
Yellow Moruya.
Yellow Mastodon.
Palecap Horsetooth.
Prairie Queen.
Chester County.
Craig Mitchell.
Eureka.
Eclipse.
Golden Drop.
King of the Earlies.
Large Yellow Horsetooth.
Pride of the North.
Sibley.

Popular Descriptions of Grasses.

[Continued from page 558.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE ERAGROSTIS GRASSES OF THE TABLELANDS AND INTERIOR.

The structure of many of the Eragrostis grasses of the interior is remarkably adapted to withstand the hot, semi-arid conditions of the summer months. As a rule, the leaves are narrow and wiry, presenting a small surface for transpiration, and being so constructed as to retain, as far as possible, the limited amount of moisture available to the plant. These drought-resistant characteristics are not confined to the leaves alone, but the roots have them also. The principal adaptations for protecting the roots of the grasses are (1) the presence of sheathing leaves and hairs situated at and enveloping the base of the stem, and (2) the persistence in the old root of a sheathing case of sand. As regards the hairs on the sheathing leaves, they are often so thickly developed as to form quite a felt. When the hairs are so dense they must act as one of the greatest deterrents to what would otherwise be a rapid evaporation, thus serving the purpose of a blanket.

The roots of many of the inland Eragrostis grasses are numerous (over 100 were counted in one plant) and of great length, and all descend vertically, practically without any branching.

The presence of the sheathing case, composed principally of sand grains, is probably due to the secretion of mucilage from the outer rows of cells in the root. In investigations carried out with some North African grasses, growing in similar situations to those of many of our inland Eragrostis species, it was found that root hairs persisted on the old roots right to their point of insertion on the stem, and consequently the sheaths of mucilage and sand served the very important function of protecting these root hairs. The latter, in times of drought, would certainly be shrivelled up were it not for this sheathing case.

The extreme length of the roots is necessary to tap the moisture, which rapidly sinks through the absorbent, sandy soil. The scarcity of branching in the roots is also due, of course, to the fact that surface moisture is very limited in quantity.

Most of the Eragrostis grasses of the interior, on account of their drought-resistant properties, are called "never fail" grasses, an excellent term, considering that when most of the succulent grasses are dried up by the hot conditions, the Eragrostis species never fail to produce feed in critical periods. One could not compare them in palatability and quantity of feed

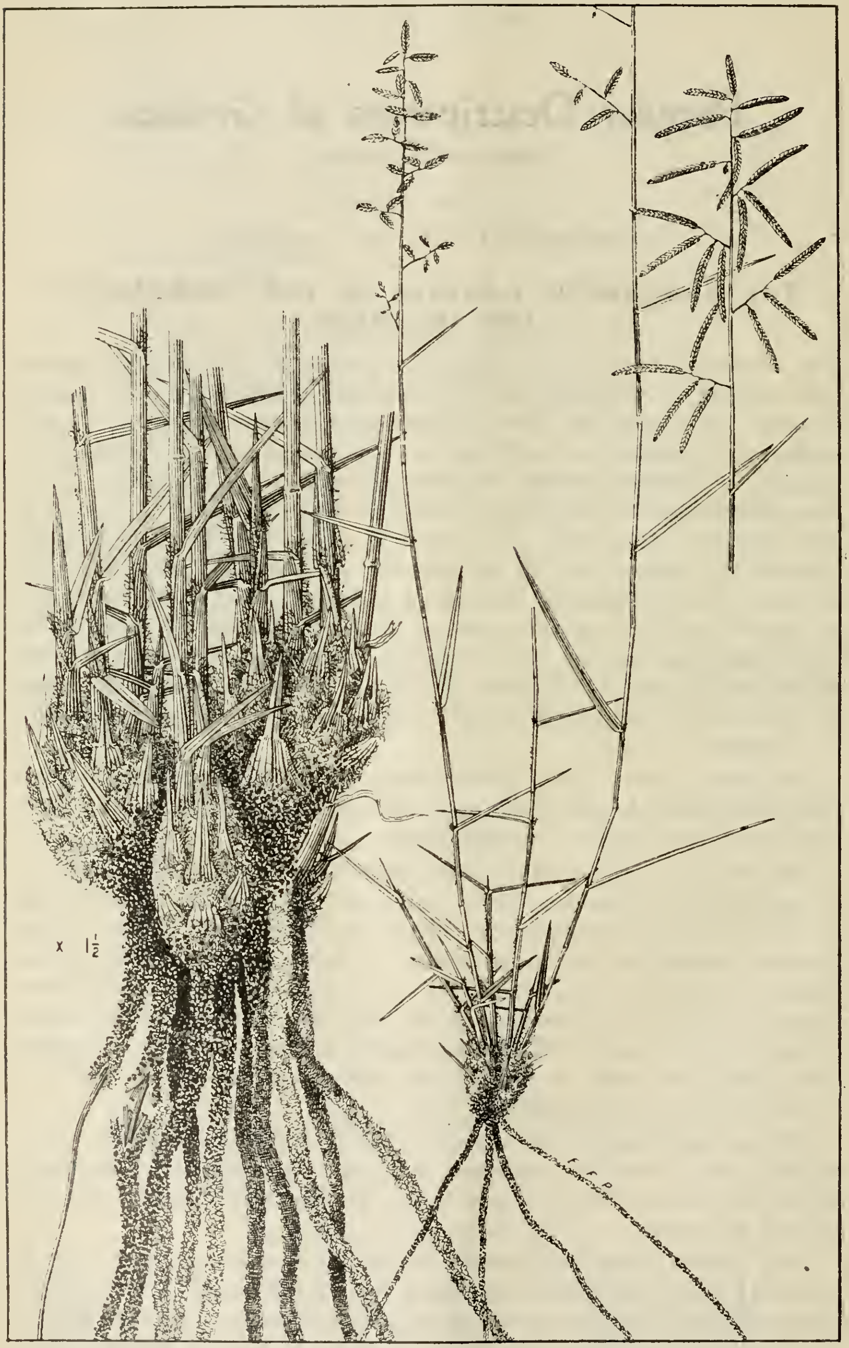

Fig. 1.—"Never-fail" Grass (*Eragrostis eriopoda*).
Note the densely hairy felt and the sheathing cases of sand around the roots, typically characteristic of our interior "woolly" Eragrostis grasses.

POPULAR DESCRIPTIONS OF GRASSES.

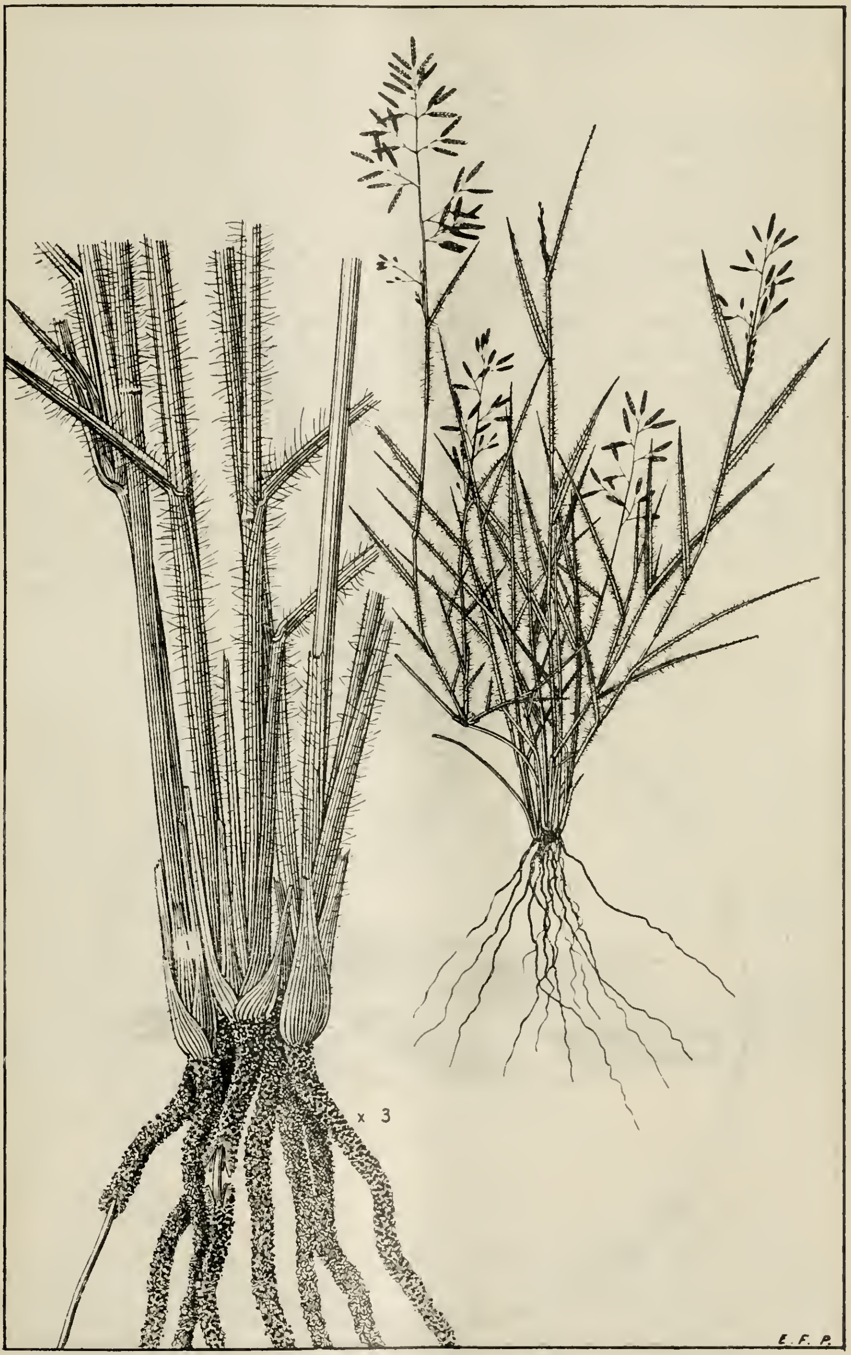

Fig. 2.—*Eragrostis lacunaria.*
A small hairy wiry grass of our semi-arid districts.

POPULAR DESCRIPTIONS OF GRASSES.

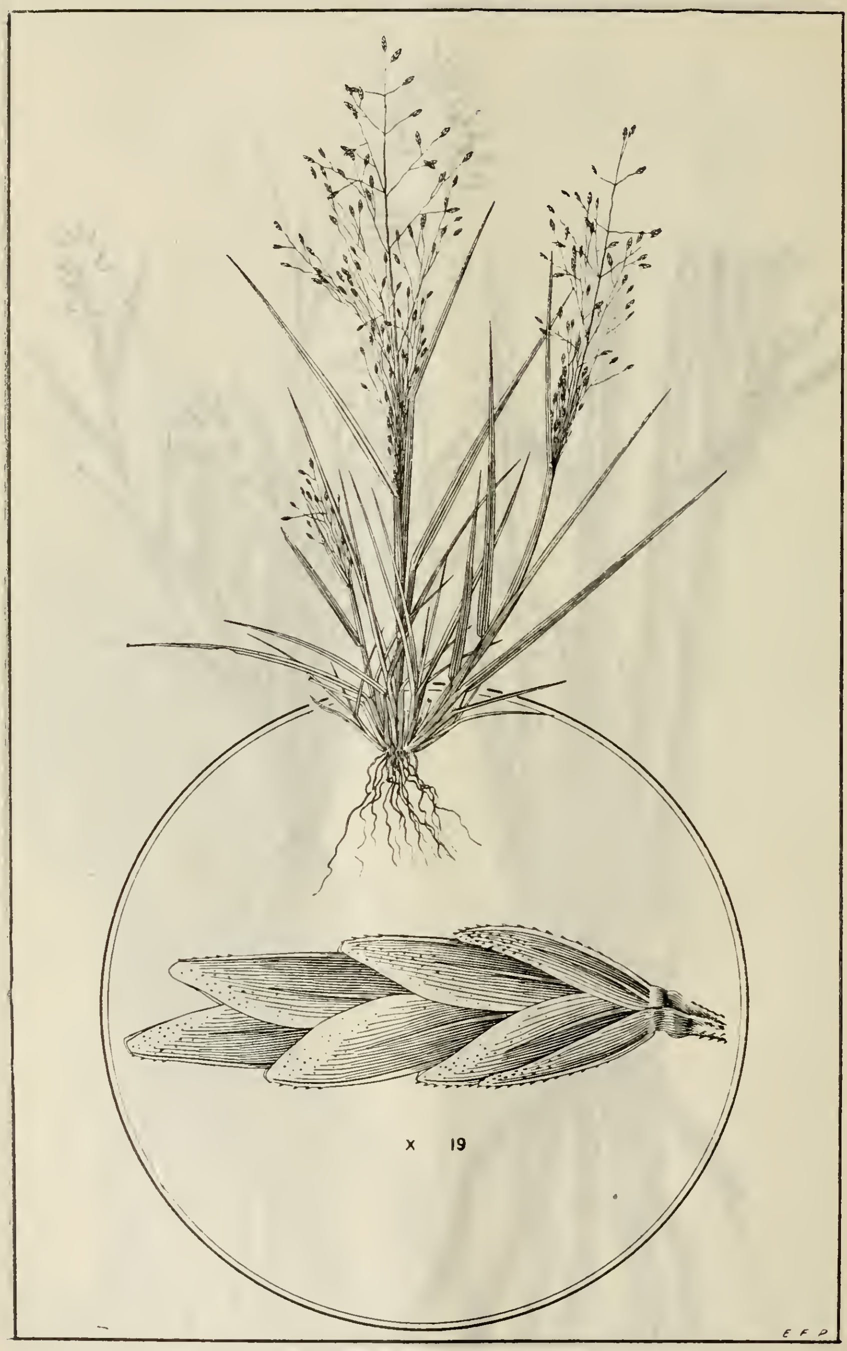

Fig. 3.—*Eragrostis trachycarpa.*

This is not a drought-resistant grass, but is common in elevated districts with a good summer rainfall.

POPULAR DESCRIPTIONS OF GRASSES.

produced with such grasses as the Panic or Andropogon species, but as drought-resistant, hardy grasses they serve a very important function in providing feed during our periodic droughts.

The principal grasses of this species in the interior are the woolly varieties, including *E. laniflora* and *E. eriopoda,* which occur in particularly dry situations, and the non-woolly species, including *E. lacunaria, E. falcata, E. chætophylla,* and *E. leptocarpa.* The last group, of which *E. lacunaria* is a typical representative, are common on the Western Slopes and plains possessing a moderate rainfall. The red chocolate soils suit them admirably. They are very rapid-growing grasses, and amongst the first to come into seed after heavy summer thunderstorms. As with the woolly Eragrostis species, they are not appreciated to any extent if other grasses are plentiful; but there is no doubt about the manner in which they are readily eaten by sheep during a dry spell. Experiments carried out at Nyngan indicate that *E. lacunaria* does not respond well to cultivation, and the right position of these grasses therefore appears to be amongst the uncultivated native pastures. Mr. Fred. Turner has drawn attention to the fact that *E. lacunaria* could be well utilised as an ornamental grass, and there is no doubt that when this grass, with its handsome purple panicles, is plentiful in a pasture, a prettier sight it would be difficult to imagine.

The principal Eragrostis grass on the tablelands is *E. trachycarpa.* As will be seen in the accompanying drawing, this grass is small in stature, and is characterised by extremely small flowering spikelets. A very important feature in connection with this grass is the manner in which it readily adapts itself to pasture or cleared paddocks. In this respect it reminds one very forcibly of the coastal Paddock Love grass (*E. leptostachya*). In the cultivated pastures of Glen Innes, consisting principally of cocksfoot and rye grass, it has spread to such an extent that it has actually succeeded in crowding out the perennial rye grass.

This grass makes its best growth in the summer and autumn months. Its succulent flag is readily eaten by sheep, and it appears to withstand a considerable amount of grazing.

E. trachycarpa occurs on the more elevated portions of the tablelands throughout the length of the State, but appears to be more common in New England than elsewhere, probably on account of the more abundant summer rains in that region.

CLEARING LAND AND SUBSOILING WITH EXPLOSIVES.

A LIMITED number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Field Assistant, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

QUANTITY AND QUALITY OF NEW SOUTH WALES BUTTER, 1916–18.

THE following figures, showing a comparison of the quantities and qualities of factory butter manufactured in public factories in New South Wales each month during the years 1916–17 and 1917–18 have been compiled from monthly statements furnished under the Dairy Industry Act by the various factory managers. It will be noted with regard to choicest quality butter manufactured that, with the exception of April, each month of 1917–18 shows an increased percentage, and that whilst in July, 1916, the percentage of choicest was 77·4, in June, 1918—two years later—it had increased to 88·6.

Month.	1916-17.							1917-18.							Percentage of increase or decrease in quality.			Percentage of increase or decrease in total production.
	Choicest.		First Grade.		Second Grade.		Total.	Choicest.		First Grade.		Second Grade.		Total.				
	lb.	Per-centage.	lb.	Per-centage.	lb.	Per-centage.	lb.	lb.	Per-centage.	lb.	Per-centage.	lb.	Per-centage.	lb.	Choicest.	1st grade.	2nd grade.	
July ..	2,735,393	77·4	680,022	19·3	117,981	3·3	3,533,396	2,359,605	88·2	263,631	9·9	50,423	1·9	2,673,659	10·8	— 9·4	— 1·4	— 24·3
August ..	2,947,230	83·4	463,809	13·1	122,532	3·5	3,533,571	2,318,655	87·8	271,270	10·3	50,473	1·9	2,640,398	4·4	— 2·8	— 1·6	— 25·3
September ..	3,532,226	78·9	705,454	15·8	237,514	5·3	4,475,194	2,644,018	84·1	419,254	13·3	80,796	2·6	3,144,068	5·2	— 2·6	— 2·7	— 29·7
October ..	4,793,561	75·2	1,269,439	19·9	314,368	4·9	6,377,368	5,530,183	83·0	907,176	13·6	225,644	3·4	6,663,003	7·8	— 6·3	— 1·5	4·5
November ..	5,721,701	73·9	1,621,860	21·0	395,573	5·1	7,739,134	6,822,607	81·0	1,180,537	14·0	415,405	5·0	8,418,549	7·1	— 7·0	— 0·1	8 8
December ..	6,509,332	74·0	1,686,888	19·2	603,529	6·8	8,799,749	7,935,096	77·7	1,680,894	16·5	596,031	5·8	10,212,021	3·7	— 2·7	— 1·0	16·0
January ..	7,044,176	72·4	1,925,398	19·8	755,032	7·8	9,724,606	7,942,226	76·8	1,675,438	16·2	720,009	7·0	10,337,673	4·4	— 3·6	— 0·8	6·3
February ..	6,396,261	75·8	1,566,151	18·6	471,671	5·6	8,434,083	7,108,255	77·8	1,394,698	15·3	633,491	6·9	9,136,444	2·0	— 3·3	1·3	8 2
March ..	6,473,156	78·5	1,330,591	16·1	445,541	5·4	8,249,288	6,807,586	80·2	1,175,836	13·9	500,780	5·9	8,484,202	1·7	— 2·2	0·5	2·8
April ..	5,183,366	83·2	838,246	13·4	210,970	3·4	6,232,582	5,408,461	82·9	854,076	13·1	258,104	4·0	6,520,641	— 0·3	— 0·3	0·6	4·6
May ..	3,902,448	86·5	507,746	11·3	99,423	2·2	4,509,617	4,344,215	86·8	507,990	10·2	150,216	3·0	5,002,421	0·3	— 1·1	0·8	10·9
June ..	2,846,980	88·5	318,898	9·9	49,771	1·6	3,215,649	3,008,456	88·6	337,369	9·9	49,256	1·5	3,395,081	0·1	— 0·0	— 0·1	5·6
Total ..	58,085,830	77·6	12,914,502	17·3	3,823,905	5·1	74,824,237	62,229,363	81·2	10,668,169	13·9	3,730,628	4·9	76,628,160	3·6	— 3·4	— 0·2	2·4

(—) Signifies decrease.

The months of July, August, and September, 1917, show a big decrease in the total quantity of butter manufactured, but the other months show an increase when compared with the same months of 1916. In view of the present acute shortage of butter, it will be interesting to see whether the months of July, August, and September of the present year will show a similar decrease.

The grand total for the year 1917–18 (76,628,160 lb.) is 2·4 per cent. in excess of that for the previous year (74,824,237 lb.). The percentage of choicest quality has increased from 77·6 in 1916–17 to 81·2 in 1917–18. This increase of 3·6 per cent. over such a high percentage as 77·6 is very satisfactory, and the factory managers and those responsible are to be congratulated on the result.—W. B. HICKEY, Inspector of Dairy Factory Accounts.

Weed Seeds and Impurities in Imported Seeds.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

DURING the past twelve months the examination, under the Federal quarantine regulations, of all agricultural, vegetable and farm seeds imported into New South Wales for weed seeds and fungus diseases has been continued. In comparing the results of such examination with those of the previous twelve months, it is noticeable that whereas 175 out of 1,000 samples were impure during the year ending June, 1917, 346, or nearly double the number, in 1,000 samples were found to be impure during the year ending June, 1918. Also, whereas 117 different kinds of weed seeds were noticed in the first 1,000 samples, during the last year 150 different varieties have been detected. In addition, more seed than last year was ordered to be cleaned before being allowed to be submitted for sale. These facts tend to show that close watchfulness is necessary to prevent the importation of new weed seeds, or of weeds which are already a great source of trouble in the State.

The weed problem in New South Wales is becoming most serious. On every hand one hears reports of the manner in which noxious weeds are obtaining a hold on our wheat and pastoral lands, and in some districts the depreciation of land as the result of such weed growth is estimated at 20 to 30 per cent. Some farmers have been completely forced out of farming as the result of weed encroachment.

Although there is plenty of urgent work to do in suppressing the weeds already established, nevertheless the task of preventing any more noxious and other weed impurities from being imported requires a good deal of attention. The Federal Government is alive to this matter, and as far as this State is concerned very few seeds are imported which escape the detection of the quarantine officials. The seed is tested at the seed-testing laboratory of the Botanic Gardens, and reports issued on the results of such testing.

It is a matter of some importance to note that the seeds imported from New Zealand are generally impure, and often contain such a large percentage of impurities as to render them unfit for sowing. Probably the war conditions and consequent scarcity of labour have had something to do with this, as even from such an intensively cultivated country as France some very impure seed has been received.

Some of the worst samples of seed submitted for examination were as follows :—

PERCENTAGE OF WEED SEEDS AND IMPURITIES IN SOME SAMPLES.

Name of Seed.	Whence Imported.	Percentage of Impurities.	Name of Impurities.	Number of Impurities in 1 lb. of Seed.
Barley ...	U.S.A. ...	6	*Avena fatua* (Wild Oat).	160
			Lolium temulentum (Darnel).	32
			Brassica sp. (Mustard).	96
			Centaurea solstitialis (St. Barnaby's Thistle).	520
Carrot ...	N.Z. ...	1·1	*Polygonum persicaria* (Smart weed).	2,560
			Chenopodium album (Fat Hen).	256
			Brassica sp. (Mustard).	128
Curled Cress.	England...	3	*Lepidium campestre* (Mustard).	256
			Matricaria inodora (May weed).	1,280
			Plantago sp. (Rib grass).	2,400
			Stellaria media (Chickweed).	320
			Rumex sp. (Dock) ...	320
Egyptian Clover.	France ...	9	*Melilotus parviflora* (Hexham Scent).	10,016
			Rumex sp. (Dock) ...	284
			Brassica sp. (Mustard)	960
			Polygonum aviculare (Wire Weed).	64
			Anthemis arvensis ...	96
Grimm Lucerne.	U.S.A. ...	1	**Salsola Tragus* (Russian Thistle).	256
			Chenopodium album (Fat Hen).	1,024
			Setaria viridis (Pigeon grass).	256
Linseed ...	Japan ...	3	*Cuscuta epilinum* (Dodder).	1,024
			Setaria sp. (Pigeon grass).	1,664
			Panicum crus-galli (Swamp or Barnyard grass).	432
Meadow Foxtail grass.	N.Z. ...	3·5	*Holcus lanatus* (Yorkshire Fog).	3,840
			Lolium perenne (Perennial Rye grass).	6,000
			Festuca bromoides (Rat's Tail Fescue)	3,200
			Anthoxanthum odoratum (Sweet-scented Vernal grass).	1,920
			Deschampsia flexuosa (Silvery grass).	1,600
			Danthonia pilosa (Wallaby grass).	1,280
			Hypochœris radicata (Cat's Ear).	64
Parsley ...	U.K. ...	5	*Matricaria inodora* (May weed).	11.200
			Papaver dubium (Poppy).	800
			Chenopodium album (Fat Hen).	32
			Rumex sp. (Dock) ...	192
Phalaris bulbosa.	N.Z. ...	4	*Anagallis arvensis* (Pimpernel).	6,336
			Silene gallica (Catchfly).	4,224
			Chenopodium album (Fat Hen).	1,664
			Festuca pratensis (Meadow Fescue).	1,664
			Sonchus oleraceus (Sow Thistle).	832
			S. asper (Sow Thistle)	640
			Plantago lanceolata (Rib grass).	704
			Trifolium minus (Suckling Clover).	512
			Polygonum persicaria (Smart weed).	384
			Geranium dissectum ...	192
			Rumex acetosella (Sorrel).	192
			Rumex crispus (Dock)	64
Rib grass	N.Z. ...	10	Rye grass	38,840
			Ranunculus parviflorus (Wild Buttercup).	1,920
			Holcus lanatus (Yorkshire Fog).	1,600
			Trifolium repens (White Clover).	800
			Medicago lupulina (Yellow Trefoil).	320
			M. maculata (Spotted Trefoil).	480
			Sherardia arvensis ...	128
			Anthemis cotula ...	96
			Rumex acetosella (Sorrel).	96
			Rumex sp. (Dock) ...	160
White Clover.	N.Z. ...	6	*Rumex acetosella* (Sorrel).	14,720
			Silene gallica (Catch Fly).	17,280
			Plantago lanceolata (Rib grass).	3,072
			Rumex sp. (Dock) ...	640
			Trifolium minus (Suckling Clover).	448
			Chenopodium album (Fat Hen).	1,280

* One of the worst pests in America, but not yet established in this State.

A complete tabulated list of all the different kinds of weeds and impurities present in the 1,000 samples is here appended :—

WEED SEEDS AND IMPURITIES.

Weed Seeds or Impurities.	Agricultural, Farm, or Vegetable Seed containing Weed Seeds or Impurities.	Country whence Imported.	Number of samples containing Weed Seeds or Impurities.
Achillea millefolium (Yarrow).	*Agrostis vulgaris* (Creeping Bent grass).	U.K.	1
Alopecurus agrestis (Foxtail grass).	*Alopecurus pratensis.*	N.Z.	1
Alopecurus pratensis (Foxtail grass).	Linseed	India	1
Amaranthus retroflexus (Red Leg or Pigweed).	Marjoram	U.S.A.	1
Amaranthus sp.	Yellow Millet	Japan	1
	Celery	U.K.	1
Anagallis arvensis (Pimpernel).	Parsley	N.Z.	1
	Phalaris bulbosa	N.Z.	1
Anthemis arvensis	Leek	U.K.	1
	Medicago lupulina.	France	1
	Trifolium repens	N.Z.	1
Anthemis cotula (Chamomile).	Rib grass	N.Z.	1
Anthemis tinctorum	Chicory	U.K.	1
Anthemis sp.	Beet	France	1
Anthoxanthum odoratum (Sweet-scented Vernal grass).	Rib grass	N.Z.	1
	Alopecurus pratensis.	N.Z.	1
	Cynosurus cristatus.	N.Z.	1
	Sheep's Fescue	N.Z.	1
	Chewing's Fescue	N.Z.	1
	Perennial Rye	N.Z.	1
Apium leptophyllum (Wild Celery)	*Alopecurus pratensis.*	Russia	1
	Celery	U.K.	2
Asperula azurea	Rape	Japan	1
Asphodelus fistulosus (Wild Onion).	Linseed	India	15
	Linseed	N.Z.	1
	Celery	N.Z.	1
Avena fatua (Wild Oat).	Barley	U.S.A.	3
	Canary Seed	Morocco	1
	Beet	France	1
Avena sp.	Linseed	N.Z.	1
	Carrot	Morocco	1
Atriplex sp. (Saltbush).	Cress	England	1
Brassica alba (Mustard).	Linseed	India	1
B. nigra (Mustard)	*Phalaris bulbosa*	N.Z.	1
Brassica sp. (Mustard).	Barley	U.S.A.	2
	Thyme	U.K.	1
	Parsley	U.K.	2
	Linseed	India	19
	Linseed	Japan	5
	Canary seed	Morocco	4
	Canary seed	London	5
	Perennial Rye	N.Z.	1
	Red Clover	N.Z.	1
	Italian Rye	N.Z.	1
	Carrot	N.Z.	2
	Berseem	France	1
	Carrot	U.K.	1
	Cress	England	1
Bromus hordeaceus (Goose grass).	Meadow Fescue	U.S.A.	1
Bromus inermis (Hungarian Brome grass).	Cocksfoot	N.Z	1
Bromus sp.	Linseed	N.Z.	2
	Perennial Rye	N.Z.	4
	Cocksfoot	N.Z.	2
	Meadow Fescue	N.Z.	1
	Red Cabbage	England	1
Camelina sativa (False Flax).	White Clover	N.Z.	1
Capsella bursa-pastoris (Shepherd's Purse).	Kentucky Blue	N.Z.	1
Carduus acanthoides (Thistle).	White Clover	N.Z.	1
Carex sp. (Sedge)	Fiorin	N.Z.	1
Centaurea solstitialis.	Barley	U.S.A.	1
Centaurea melitensis (Maltese Thistle).	Canary seed	Morocco	1
Centaurea nigra (Thistle).	Canary seed	Morocco	1
Cerastium vulgatum (Mouse-ear), Chick-weed).	Kentucky Blue	N.Z.	1
	White Clover	N.Z.	1
Chenopodium album (Fat Hen).	Cress	N.Z.	2
	Cress	England	2
	Endive	U.K.	1
	Celery	U.K.	3
	Celery	France	1
	Carrot	N.Z.	9
	Carrot	England	1
	Meadow Fescue	N.Z.	1
	Red Clover	N.Z.	2
	White Clover	N.Z.	3
	Rape	Japan	1
	Radish	U.K.	1
	Parsley	France	1
	Parsley	England	2
	Parsley	U.K.	3
	White Millet	Japan	1
	Sweet Marjoram	France	1
	Linseed	India	5
	Linseed	N.Z.	6
	Leek	U.K.	1
	Lettuce	N.Z.	2
	Kentucky Blue	N.Z.	1
	Phalaris bulbosa	N.Z.	1
Cichorium intybus (Chicory).	Leek	U.K.	1
	Cabbage	U.K.	1
	Carrot	U.K.	1
Compositæ	Linseed	India	1
	Lavender	U.K.	1
Cnicus arvensis (Creeping Corn Thistle).	Parsley	U.K.	1
	Carrot	France	1
Cnicus sp.	Sage	France	1
Convolvolus arvensis (Bindweed).	Parsley	England	1
	Red Millet	Japan	1
	Canary seed	Morocco	2
	Carrot	England	1
Convolvolus erubescens (Bindweed).	Onion	N.Z.	1
Convolvolus sp.	Parsley	France	1
	Yellow Millet	Japan	1
	Leek	U.K.	1
	Canary seed	Morocco	5
	Crimson Clover	N.Z.	1
	Carrot	N.Z.	1

WEED SEEDS AND IMPURITIES—*continued.*

Weed Seeds or Impurities.	Agricultural, Farm, or Vegetable Seed containing Weed Seeds or Impurities.	Country whence Imported.	Number of samples containing Weed Seeds or Impurities.
Crepis capillaris (Hawkweed).	Linseed	N.Z.	1
	Crested Dogstail	N.Z.	1
Crepis virens	Carrot	U.K.	1
Cuscuta epilinum (Dodder).	Linseed	Japan	3
Cynosurus cristatus (Crested Dogstail).	Perennial Rye	N.Z.	1
	Hard Fescue	N.Z.	1
	Sheep's Fescue	N.Z.	1
Cyperaceæ	Kentucky Blue	N.Z.	1
	Creeping Bent grass.	U.K.	1
Danthonia pilosa (White Top grass).	Meadow Foxtail	N.Z.	1
Deschampsia flexuosa (Silvery grass).	Meadow Foxtail	N.Z.	1
Echium sp.	Cummin	France	1
Ergot	Perennial Rye	N.Z.	1
	Tall Fescue	N.Z.	1
Eruca sativa (Rocket).	Linseed	India	16
	Linseed	Japan	6
Festuca bromoides (Rat's Tail Fescue grass).	Perennial Rye	U.S.A.	2
	Perennial Rye	N.Z.	11
	Meadow Fescue	N.Z.	1
	Meadow Foxtail	N.Z.	1
	Crested Dogstail	U.K.	1
Festuca elatior (Tall Fescue grass).	Canary seed	Morocco	1
Festuca pratensis (Meadow Fescue grass).	*Phalaris bulbosa*	N.Z.	1
	Hard Fescue	N.Z.	1
Festuca sp.	Perennial Rye	N.Z.	3
	Canary seed	Morocco	1
	Meadow Foxtail	Russia	1
	Crested Dogstail	U.K.	1
	Chewing's Fescue	N.Z.	1
	Cress	U.K.	1
Fumaria officinalis (Fumitory).	Fenugreek	France	1
Galium aparine (Cleavers).	Turnip	U.K.	1
	Rape	N.Z.	3
	Rape	Japan	2
	Radish	N.Z.	2
	Radish	U.K.	2
	White Mustard	U.K.	1
	Cabbage	U.K.	2
	Millet	Japan	1
	Yellow Trefoil	N.Z.	1
	Cress	N.Z.	1
	Cress	U.K.	2
	Cummin	France	1
	Cauliflower	U.K.	2
	Beet	France	4
Geranium dissectum (Wild Geranium).	Sage	France	1
	Rape	Japan	1
	Linseed	India	2
	Phalaris bulbosa	N.Z.	1
	Meadow Fescue	N.Z.	1
	Perennial Rye	N.Z.	1
	Red Clover	N.Z.	3
	Celery	U.K.	1
Glaucium corniculatum.	Cabbage	U.K.	1
	Sweet Marjoram	France	1
Gramineæ	Linseed	N.Z.	2
	Lavender	U.K.	1
	White Clover	N.Z.	1
Guizotia abyssinica	Linseed	India	4
Holcus lanatus (Yorkshire Fog).	Linseed	N.Z.	1
	Rib grass	N.Z.	1
	Meadow Foxtail	N.Z.	1
	Crested Dogstail	N.Z.	1
	Hard Fescue	N.Z.	1
	Chewing's Fescue	N.Z.	1
Hordeum sativum (Barley).	Canary seed	Morocco	1
Hypochæris radicata (Cat's Ear).	Linseed	N.Z.	7
	Perennial Rye	U.S.A.	3
	Perennial Rye	N.Z.	7
	Crested Dogstail	N.Z.	2
	Crested Dogstail	U.K.	1
	Cocksfoot	N.Z.	2
	Meadow Fescue	N.Z.	3
Lapsana communis (Nipple wort).	Crested Dogstail	U.K.	1
	Cress	U.K.	1
	Savoy	U.K.	1
	Cabbage	France	1
Leguminosæ	Sage	France	1
	Linseed	Calcutta	1
Lepidium campestre (Pepper weed).	Cress	England	1
	Fenugreek	France	1
Lolium italicum (Italian Rye grass).	Turnip	U.K.	1
	Rib grass	N.Z.	1
Lolium perenne (Perennial Rye grass).	Linseed	N.Z.	6
	Rib grass	N.Z.	1
	Canary seed	Morocco	7
	Canary seed	London	2
	Meadow Foxtail	N.Z.	1
	Cocksfoot	N.Z.	1
	Chewing's Fescue	N.Z.	1
	Hard Fescue	N.Z.	2
	Sheep's Fescue	N.Z.	1
	Italian Rye	N.Z.	1
	Meadow Fescue	N.Z.	1
Lolium temulentum (Darnel).	Barley	U.S.A.	3
	Linseed	Calcutta	2
	Canary seed	Morocco	8
	Canary seed	London	5
	Canary seed	Japan	1
	Perennial Rye	N.Z.	1
Lolium sp.	Parsley	N.Z.	1
	Cocksfoot	N.Z.	1
Lotus angustissimus (Bird's Foot Trefoil).	Red Clover	N.Z.	1
Lychnis flos-cucculi (Ragged Robin).	Kentucky Blue	N.Z.	1
Malva multifida (Mallow).	Fenugreek	France	1
Malva parviflora	Canary seed	London	1
	Canary seed	Morocco	1
Matricaria inodora (May weed).	Parsley	England	1
	Parsley	U.K.	1
	Cress	England	1
Medicago denticulata (Burr Trefoil).	Beet	France	1
Medicago lupulina (Yellow Trefoil).	Sheep's Burnet	France	1
	Sage	France	1
	Yellow Trefoil	N.Z.	1
	Linseed	India	10
	Canary seed	Morocco	1
	Cocksfoot	N.Z.	1
	Crimson Clover	N.Z.	1
	White Clover	N.Z.	1
Medicago maculata (Spotted Trefoil).	Rib grass	N.Z.	1
Medicago sativa (Lucerne).	Leek	N.Z.	1

WEED SEEDS AND IMPURITIES—*continued.*

Weed Seeds or Impurities.	Agricultural, Farm, or Vegetable Seed containing Weed Seeds or Impurities.	Country whence Imported.	Number of samples containing Weed Seeds or Impurities.
Medicago sp.	Carrot	N.Z.	2
	Chicory	U.K.	1
	Carrot	France	1
	Alsike Clover	Canada	1
Melilotus parviflora (Hexham Scent).	Linseed	India	1
	Berseem	France	1
Mentha sp.	Marjoram	U.S.A.	1
Myosotis arvensis (Forget-me not).	White Clover	N.Z.	1
Myosotis sp.	White Clover	N.Z.	1
Panicum crus-galli (Barn-yard grass).	Red Millet	Japan	6
	White Millet	Japan	5
	Yellow Millet	Japan	3
	Linseed	Japan	3
	Carrot	France	1
	Carrot	N.Z.	3
Panicum miliaceum (French Millet).	Rape	Japan	1
	Linseed	Japan	1
	Hemp	Japan	1
	Canary seed	Morocco	1
Panicum sp.	White Millet	Japan	5
	Hemp	Japan	1
	Celery	U.K.	1
Papaver dubium (Poppy).	Parsley	U.K.	1
	Lettuce	N.Z.	1
Papaver hybridum	Cress	U.K.	1
Papaver rhœas	Kentucky Blue	America	1
Parsley	Sweet Marjoram	France	1
Paspalum dilatatum	*Danthonia semiannularis.*	N.Z.	1
Phalaris bulbosa	Rape	Japan	...
Phalaris minor	Rib grass	N.Z.	1
Phalaris sp.	Linseed	India	1
	Canary seed	London	1
	Canary seed	Morocco	2
	Cauliflower	U.K.	1
	Perennial Rye	N.Z.	1
Phleum pratense (Timothy grass).	Alsike Clover	N.Z.	1
	White Clover	N.Z.	1
	Alsike Clover	Canada	1
	Creeping Bent grass.	N.Z.	1
Picris echiodes (Ox Tongue).	Rape	Japan	1
	Leek	U.K.	1
	Lettuce	N.Z.	1
	Perennial Rye	N.Z.	1
	Carrot	N.Z.	1
	Celery	U.K.	1
Picris sp.	Celery	U.K.	1
Pisum sp.	Yellow Millet	Japan	1
Plantago lanceolata (Rib grass).	Thyme	U.K.	1
	Marjoram	U.K.	1
	Linseed	N.Z.	4
	Perennial Rye	N.Z.	2
	Phalaris bulbosa	N.Z.	1
	Canary seed	Morocco	1
	Crested Dogstail	N.Z.	1
	Cocksfoot	N.Z.	1
	Meadow Fescue	N.Z.	1
	Red Clover	N.Z.	7
	White Clover	N.Z.	6
	Crimson Clover	N.Z.	3
	Cress	England	1
	Alsike Clover	Canada	1
Plantago sp.	Cress	England	1
Polygonum convolvolus (Climbing Buckwheat).	Spinach	France	1
	Rape	N.Z.	4
	Rape	Japan	2
	Radish	U.K.	2
	Linseed	Japan	4
	Linseed	N.Z.	1
	Hemp	Japan	4
	Red Millet	Japan	4
	Marjoram	France	1
	Cabbage	U.K.	3
	Carrot	N.Z.	1
	Endive	U.K.	1
	Onion	U.K.	1
Polygonum aviculare (Wire weed)	Parsley	England	1
	White Mustard	U.K.	1
	Linseed	Calcutta	1
	Linseed	N.Z.	4
	Leek	U.K.	1
	Meadow Fescue	U.S.A.	1
	Carrot	U.K.	3
Polygonum lapathifolium (Slender Smart weed).	Linseed	Japan	1
	Leek	N.Z.	1
	Carrot	N.Z.	4
	Carrot	England	1
Polygonum persicaria (Smart weed).	White Millet	Japan	1
	Linseed	N.Z.	2
	Linseed	Japan	1
	Phalaris bulbosa	N.Z.	1
	Meadow Fescue	N.Z.	1
	Carrot	France	2
	Carrot	N.Z.	4
	Carrot	U.K.	1
	Carrot	U.S.A.	2
Polygonum sp.	Millet	Japan	1
	Kentucky Blue	America	1
	Kentucky Blue	N.Z.	1
Portulaca oleracea (Purslane).	Rape	Japan	1
Prunella vulgaris (Self Heal).	Crested Dogstail	U.K.	1
	Red Clover	N.Z.	2
	White Clover	N.Z.	3
Ranunculus parviflorus (Wild Buttercup).	Rib grass	N.Z.	1
Ranunculus sp.	Meadow Foxtail	Russia	1
	Rye grass	N.Z.	1
Rumex acetosella (Sorrel).	Parsley	France	1
	Parsley	N.Z.	1
	Linseed	India	2
	Linseed	N.Z.	12
	Linseed	Japan	1
	White Clover	N.Z.	4
	Red Clover	N.Z.	6
	Lettuce	N.Z.	3
	Perennial Rye grass.	N.Z.	2
	Kentucky Blue	N.Z.	2
	Phalaris bulbosa	N.Z.	1
	Crested Dogstail	U.K.	1
	Cocksfoot	N.Z.	1
	Chicory	U.K.	1
	Celery	N.Z.	1
	Carrot	N.Z.	1
Rumex crispus (Curled Dock).	Linseed	N.Z.	5
	Phalaris bulbosa	N.Z.	1
	Crested Dogstail	U.K.	1
	Cocksfoot	N.Z.	1
	Perennial Rye	N.Z.	6

WEED SEEDS AND IMPURITIES—*continued.*

Weed Seeds or Impurities.	Agricultural, Farm, or Vegetable Seed containing Weed Seeds or Impurities.	Country whence Imported.	Number of samples containing Weed Seeds or Impurities.
Rumex sp. (Dock)	Meadow Foxtail	Russia ...	1
	Perennial Rye ...	N.Z. ...	1
	Timothy grass ...	U.K. ...	2
	Swede	U.K. ...	1
	Carrot	France ...	1
	Parsley	U.K. ...	1
	Berseem... ...	France ...	1
	Red Millet ...	Japan ...	1
	Linseed	N.Z. ...	1
	Linseed	India ...	1
	Thousand-headed Kale.	U.K. ...	1
	Kentucky Blue...	U.S.A. ...	1
	Canary seed ...	Morocco	4
	Cabbage... ...	U.K. ...	2
	Red Clover ...	N.Z. ...	5
	White Clover ...	N.Z. ...	3
	Cress	England	2
	Alsike Clover ...	N.Z. ...	1
	Carrot	N.Z. ...	2
Salsola Tragus (Russian Thistle).	Grimm Lucerne ..	U.S.A. ...	1
Sainfoin	Sheep's Burnet	France ...	1
Salvia sylvestris (Wild Sage).	Sage	France ...	1
Scirpus sp. (Sedge)...	Kentucky Blue	U.K. ...	1
Senecio sp. ...	Cabbage... ...	U.K. ...	1
	Perennial Rye ...	N.Z. ...	1
Setaria glauca (Pigeon grass).	Red Millet ...	Japan ...	1
	Rape	Japan ...	1
Setaria italica	Parsley	U.K. ...	1
	Red Millet ...	Japan ...	1
Setaria viridis ...	Grimm Lucerne	U.S.A. ...	1
Setaria sp. ...	Rape	Japan ...	1
	Red Millet ...	Japan ...	4
	White Millet ...	Japan ...	10
	Yellow Millet ...	Japan ...	3
	Linseed	India ...	4
	Linseed	Japan ...	6
	Hemp	Japan ...	4
	Red Clover ...	N.Z. ...	3
	Celery	U.K. ...	5
	Celery	France ...	4
	Carrot	England	3
	Carrot	N.Z. ...	3
	Carrot	France ...	4
Sherardia arvensis	Rib grass ...	N.Z. ...	1
	Yellow Trefoil ...	N.Z. ...	1
	Linseed	N.Z. ...	1
	Crested Dogstail	U.K. ...	1
	White Clover ...	N.Z. ...	3
Silene dichotoma	White Clover ...	N.Z. ...	1
Silene gallica (Catch Fly).	White Mustard	N.Z. ...	1
	Phalaris bulbosa	N.Z. ...	1
	White Clover ...	N.Z. ...	2
	Rape	Japan ...	1
	Canary seed ...	Morocco..	1
Solanaceæ	Kentucky Blue...	N.Z. ...	1
Sonchus asper (Sow Thistle).	*Phalaris bulbosa*	N.Z. ...	1
Sonchus oleraceus ...	*Phalaris bulbosa*	N.Z. ..	1
Sorghum sp.	Hemp	Japan ...	10
	Cummin... ...	France	1
	Buckwheat ...	Japan ...	1
Spergula arvensis (Spurrey).	Linseed	Japan ...	2
	Linseed	N.Z. ...	7
	Carrot	England	1
Spergula rubra ...	Thyme	U.K. ...	1
Stellaria media (Chick weed).	Turnip	U.K. ...	3
	Thyme	France...	1
	Rape	India ...	1
	Rape	N.Z. ...	1
	Parsley	England	1
	Sweet Marjoram..	France ...	1
	Sweet Marjoram..	U.S.A. ...	1
	Kentucky Blue...	N.Z. ...	1
	Canary seed ...	Morocco..	1
	Crested Dogstail	U.K. ...	1
	White Clover ...	U.K. ...	2
	White Clover ...	N.Z. ...	2
	Cress	England	3
	Cress	N.Z. ...	2
	Celery	U.K. ...	1
	Carrot	N.Z. ...	1
	Carrot	U.K. ...	1
Stellaria sp. ...	Parsley	U.K. ...	1
Thlaspis arvense (Pennycress).	Yellow Trefoil ...	France ...	1
	White Clover ...	N.Z. ...	1
	Cress	N.Z. ...	1
	Sheep's Burnet...	France ...	1
Trifolium hybridum (Alsike Clover).	Timothy grass ...	N.Z. ...	1
Trifolium incarnatum (Crimson Clover).	Carrot	U.K. ...	1
Trifolium minus (Suckling Clover).	Thyme	France ...	1
	Linseed	N.Z. ...	2
	Lettuce	N.Z. ...	1
	Red Clover ...	N.Z. ...	3
	Phalaris bulbosa	N.Z. ...	1
	Crested Dogstail	N.Z. ...	1
	White Clover ...	N.Z. ...	5
Trifolium pratense (Red Clover).	Rib grass ...	N.Z. ...	1
	Parsley	N.Z. ...	1
	Leek	N.Z. ...	1
	Yellow Trefoil ...	France ...	1
	White Clover ...	N.Z. ...	2
Trifolium repens (White Clover).	Rib grass ...	N.Z. ...	2
	Red Clover ...	N.Z. ...	1
Trifolium subterraneum (Subterranean Clover).	White Clover ...	N.Z. ...	1
Trifolium sp.	Canary seed ...	Morocco	1
	Cress	U.K. ...	1
	Carrot	U.S.A. ...	1
Triticum sativum (Wheat).	Barley	U.S.A. ...	3
	Spinach ...	France ...	1
	Rape	Japan ...	1
	Red Millet ...	Japan ...	1
	Linseed	India ...	15
	Hemp	Japan ...	2
	Leek	U.K. ...	1
	Canary seed ...	Morocco..	5
	Canary seed ...	England	6
Umbelliferæ ...	Linseed ...	Japan ...	3
Verbena hastata (Vervain).	Sweet Marjoram	U.K. ...	1
Verbena sp. ...	Sweet Marjoram	France ...	1
Vicia villosa (Hairy Vetch).	Spinach ...	France ...	1
Vicia sp. ...	Linseed	India ...	1
	Canary seed ...	Morocco..	1
	Red Clover ...	England	1
Xanthium spinosum (Bathurst Burr).	Hemp	Japan ...	1

Farmers' Experiment Plots.

DRY-LAND GRAIN SORGHUMS.

Mudgee-Coonabarabran District.

G. G. POTTS, H.D.A., H.D.D., Assistant Inspector.

DURING last season Mr. S. H. Robinson, of Tallawang, co-operated with the Department in carrying out trials of dry-land sorghums.

The plots were sown on 28th November, 1917, through a wheat drill, tubes being blocked up to make the rows 2½ feet apart.

The soil is a red clay loam—a fair representation of the surrounding district—and it had carried a crop of wheat the previous season. The rate of seeding was 8 lb. per acre; no fertiliser was applied. The preparation of the soil did not receive the best attention, as ploughing operations were not complete until the day before planting, and this, together with a harrowing after sowing, was all the cultivation the land received. It might be pointed out that seasonal conditions would not allow of earlier ploughing or of a more thorough preparation prior to planting.

No cultivation was given during the growing season, which, no doubt, reduced the yields to a large extent. Nevertheless, the results obtained were very promising, and Mr. Robinson is thoroughly satisfied, and keen to give the sorghums a further trial next season under better circumstances.

Sudan grass was also included in the trials, with very fair results.

The germination throughout was fair, but a large percentage of the plants died owing to the heavy rains experienced in November shortly after planting.

The season was extremely wet during the first few months of growth, and little comparison could be made with regard to drought-resisting qualities. The following is the rainfall during the growing period:—October, 35 points; November, 474 points; December, 207 points; January, 264 points; February, 82 points; March, 73 points; April, 123 points; total, 12·58 inches.

Varieties under Trial.

Manchu Kaoliang.—This variety matured in the middle of the season; the average height of the stalks was 5½ feet; it showed a small percentage of leaves and slender stalks, and appeared to be a weak stooler. On an average, the heads were large, erect, and loose, containing dark-brown grain well filled. A glance at the yields shows clearly that this variety gave the best results of those under trial.

Standard Milo.—This is a late maturer and a good stooler, with medium to coarse stems with few leaves; average height of stalks, 4½ feet. The heads are compact and erect, and the grain fairly large and light-brown in colour. At the commencement this variety showed promise of producing a large quantity of green fodder, and up to the time of flowering the compact heads looked promising. However, the seed set badly, and low yields were consequently obtained.

Kafir Corn.—This variety matures about the same time as Feterita, both being earlier than Manchu Kaoliang and Standard Milo. The stems are medium to thick, and carry a large percentage of broad, long leaves. The stooling ability of this variety was well marked, and the stalks averaged 4½ feet in height. The heads are long, erect, and compact, containing white, medium-sized seed. A much higher yield would have been obtained if the seed had set better.

Feterita.—This variety grew 4 feet in height and stooled freely, producing slender stalks with a large amount of leaf surface. The compact heads, which stand erect on the stalk, contained plump, attractive, large, white grain. The green fodder weights show that it did not produce bulk, but the grain was far superior in quality to any of the other varieties under trial. With regard to the setting of the seed, it was noticed that a large percentage of the heads were empty.

Sudan Grass.—In accordance with its reputation as a quick grower, this grass came away smartly after germination, and produced a fair yield of green fodder two months before the sorghums were fit to cut. The growth, however, after the first cut was very poor, so much so that no further weights were taken. This grass grew to a height of 4½ feet, and stooled profusely, producing fine stems and branched, open panicles, enclosing brown, plump seed.

The following yields per acre of green fodder and grain were harvested on the dates shown:—

Variety.	Date Cut.	Green Fodder.				Grain.	
	1918.	t.	c.	q.	lb.	bus	lb.
Manchu Kaoliang ..	7 April ...	6	1	0	0	52	52½
Standard Milo	27 ,, ...	4	1	0	2	8	32½
Kafir Corn	5 ,, ...	5	8	0	4	39	24¼
Feterita	4 ,, ...	2	3	0	20	38	50
Sudan Grass	2 Feb. ...	5	16	1	0	18	52

The results demonstrate without doubt the suitability of these sorghums for the district. Maize-growing is a gamble here, and it is only every four or five years that climatic conditions are sufficiently favourable for satisfactory yields, whereas these sorghums are certain crops, and their feeding value compares favourably with maize, although not generally recognised.

It is worth noting that Manchu Kaoliang, although giving a high comparative yield of green fodder, is not relished by stock to the same extent as other varieties on trial, owing largely to the high percentage of dry, pithy stems. This characteristic will probably be eliminated in time by careful selection.

The Insect Pests of Maize.

W. B. GURNEY, F.E.S., Assistant Entomologist.

The following notes constitute merely a preliminary record of insects so far discovered attacking maize in New South Wales, and is mainly based on data obtained during the three months from the middle of March to the middle of June of this year. This period, covering only the late autumn up to midwinter, does not allow of a consecutive account of the broods throughout the year of many species, nor can it note other species which may be found destructive at other times of the year. Some twenty-five species, however, have been recorded so far, as attacking maize in the field, as well as the cobs and shelled grain in store, and these include probably most of those which are likely to be seriously destructive. Among them, two species of moth grubs are recorded now for the first time as attacking maize in New South Wales, viz., the Pink Corn-worm (*Batrachedra rileyi* Wals.), introduced; and our native species of Sugar-cane Boring Moth (*Phragmatiphila* (*Nonagria*) *truncata* Walk.). In addition, the Green Corn-Aphis (*Aphis maidis*) and a Mealy Bug attacking the stems and cob have been noted, besides a number of cosmopolitan species of small beetles destructive to stored maize and now specifically identified. A native species of beetle, the Yellow Monolepta (*M. rosæ*) attacks the silk and foliage; and the Yellow Peach or Maize Moth grub (*Conogethes punctiferalis* Gn.), a native species of our North Coast and probably Queensland, is common in the field and in stored cobs. Finally, in the field the destructive Ear-worm infesting the cobs, and the Army-worm attacking the foliage and cobs, were found in great evidence throughout the whole three months. Infestations of the crop up to 28 per cent. were revealed in the case of "Ear-worms," and up to 86 per cent. of the crop in the case of "Army-worms."

It is of importance to note that among the various pests of stored maize recorded here, though *Tribolium* (the Red grain and flour beetle) and *Rhizopertha dominica* and other beetles were found, the chief agents of destruction are still the well-known Grain Weevil (*Calandra oryzæ*) and the common "Moth" (*Sitotroga cerealella*). These two widely different insects, sometimes mistakenly supposed by farmers to be different stages of the one pest, are both winged in the adult stage, and able to fly to the field and lay their eggs, particularly on exposed ears. To prevent such initial infestation in the field the advantage of growing maize varieties with the ears well covered by long and tight fitting husks, which prevent much infestation, is apparent. But though the infestation of cobs in the field does occur, yet even clean maize stored in sheds, in stores, on the wharves or in warehouses is readily infested by weevils from other stored corn or wheat, or even the smallest quantities of waste infested grain which may be lying about.

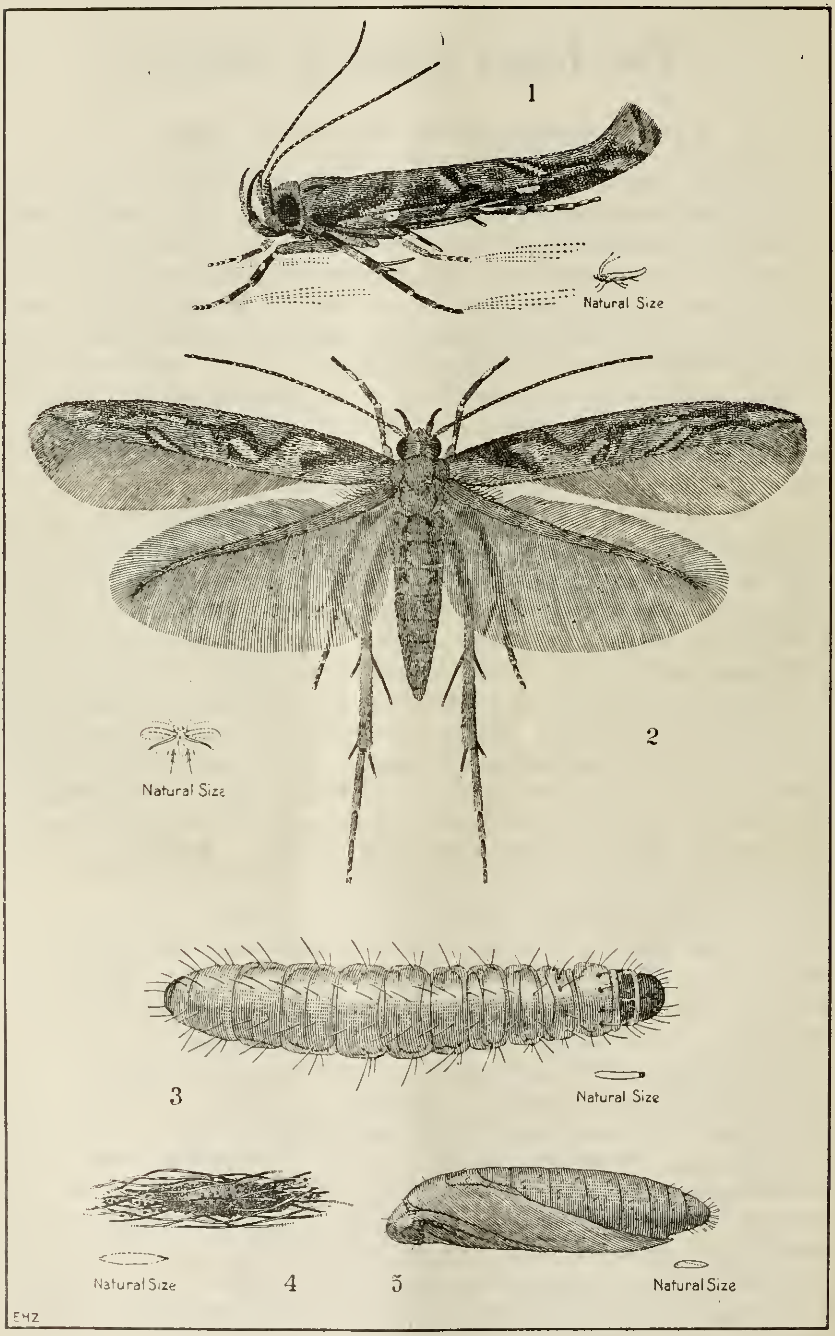

Fig. 1.—The Pink Corn-worm (*Batrachedra rileyi* Wals.).

A new record amongst our Maize Pests.

1. Moth in normal position. 2. Moth with wings expanded. 3. Pink larva, which feeds on the grains, silk, &c. 4. Cocoon, often found in the cob silks. 5. Pupa, as taken from cocoon.

THE INSECT PESTS OF MAIZE.

The chief damage to maize by insects naturally occurs in summer months, when the insects feed voraciously, develop most rapidly, and show most activity. Maize crops are planted from September on to December, and from the outset are subject to attack. The seedlings on the roots may be attacked by " wire-worms " and " White Grubs," especially crops planted in newly-turned grass land. The principal pests of the foliage are " cut-worms " and other caterpillars, chiefly the " Army-worm," in addition to the leaf and silk eating Yellow Monolepta beetles. Then the cobs and silk are subjected to the concentrated attack of Ear-worms, Army-worms, Monolepta, Yellow Maize moths, Pink Corn-worms, and finally weevil and moth.

So serious is the damage by weevil and moth to ripe corn during summer, that in the North Coast districts the earlier maize, which ripens from January to April, is usually marketed at once to avoid loss. Then during the colder months from May to August, the pest development being retarded, the damage is at a minimum, and the maize for convenience is often left standing, or stored in the husks, or else shelled and stored. But with the warmth following on August appreciable damage by the pests recommences and increases, and fumigation, cleaning up and destroying infested grain or waste, or other methods should be adopted. The bulk of our maize is grown in the district extending from the Manning to the Richmond River; and in these warm, moist parts the pests develop most rapidly, and it is just here that the problem of safe storage of maize is most acute.

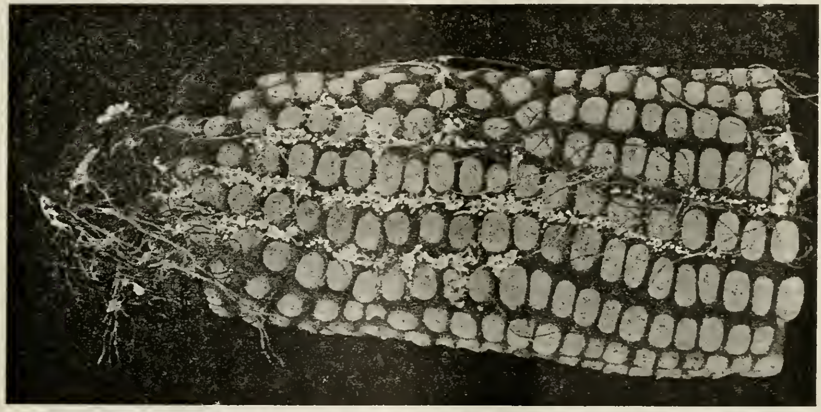

Fig. 2.—Cob damaged by the Pink Corn-worm.

Note the streaks of fine granules of excrement (smaller than those of the excrement of the Ear-worm or of the Yellow Maize Moth).

As cold retards development and lessens the number of broods, it is obvious that in the colder districts where maize or other grain is grown the damage from insects is less and the destruction of stored grain not so serious. This accounts for the fact that maize grown in such districts as New England and Tumut is, on the whole, freer from weevil, &c.

Below is given a brief account of the Pink Corn-worm which attacks the cobs and grain, and of the Army-worm. Then follows a list of all the principal insects recorded in this State as attacking maize, with notes on each species, and illustrations of some of them, and the damage they do. Later articles will furnish more details, and in addition some pests likely to be found here, or to be introduced, will then be referred to.

It is hoped that these notes may enable the farmer to identify the pests attacking his maize. Communications on the subject, and specimens from farmers, will be welcome, and information as to remedial measures which might be adopted will be furnished.

While these preliminary records are of considerable interest and importance, there are still many phases of the work which require further investigation, both as regards the life histories of these pests under varying climatic conditions and the most practicable methods of control.

The storage of maize for seed purposes and in bulk as reserve supplies for the market is essential, and measures to prevent insect attack permanently or even over a period of several months are of importance.

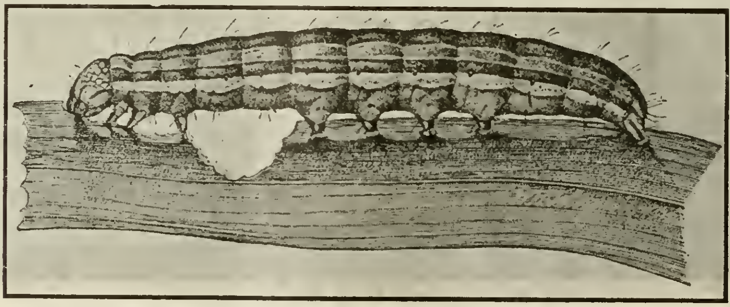

Fig. 3.—The Army Worm—the destructive larval stage of the introduced *Cirphis* (*Leucania*) *unipuncta*. Feeds on maize plants and other crops.

(After Walton. Farmers' Bulletin 731, U.S.A. Dept. Agr.).

The effectiveness of naphthalene, carbon bisulphide, lime, &c., needs comparative trials in the case of seed maize. For maize in bulk fumigation, the reduction of moisture content, the application of heat (119 degrees Fahr. destroys most insect life, including weevil), the use of carbon dioxide (either artificially introduced or naturally generated in grain stored in hermetically sealed receptacles), the efficiency and cost of various cleaning and heating machines, &c., require to be tested to ascertain which methods are most effective and economical under different circumstances.

The question then will be which of these methods is best for individual farmers to adopt, and which method is most practicable for bulk-handling by farmers in co-operation.

The Pink Corn-worm (*Batrachedra rileyi* Wals.). (Figs. 1 and 2.)

Food plants.—Maize, sugar-cane, banana, lantana, sorghum.

Damage.—Eats out grains and also feeds on the core, husks and silk of the cobs. Attacks the ears in the field and in store, but is not serious in shelled and bagged grain.

Locality.—Found in our coastal districts from the Illawarra to the Richmond River; probably extends into Queensland. Abroad it is recorded from North America and Hawaii.

The egg.—Minute, pearly white, laid on cobs.

The caterpillar.—Small, up to ⅜ inch, characteristic pink colour.

The pupa or chrysalis.—Small, brown, in light silk cocoons in husks, silk, and among the grains.

Adult moth.—Light grey brown, slender, smaller than common grain moth.

This species is now recorded for the first time as attacking maize sorghum heads in New South Wales. I have found it present at Wollongbar, Grafton, Muswellbrook, Hawkesbury Agricultural College, and Dapto. In late summer it is common on the ears, attacking the grain and top of the ear. In May and June the grubs were also commonly found in the dried silks, and were then not feeding extensively. The danger seems to be to the ripe corn grains in the field and stored cobs in the last three months of summer. The excrement of the feeding grubs is thrown out in large quantities in the form of fine granules. This is found webbed together in streaks and masses amongst the grains of the cob, and is finer and whiter than the excrement marking the presence of ear-worm grubs or Yellow Maize moth grubs which are also commonly found towards the tips of the ears. But the characteristic pink colour of the little grubs is the readiest indication that this species is infesting the cobs.

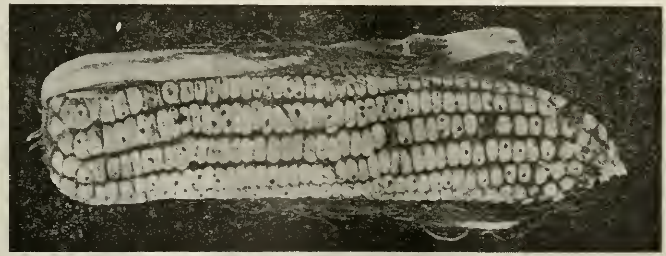

Fig. 4.—Typical damage due to Grain Weevil (*Calandra oryzæ*).

The excrement is strung lightly but toughly together by fine silk which is invisible amongst the excrement, but shows up often as streaks of white silk in the brown dry ear-silks, where the grubs also feed. The larvæ form small indistinct cocoons sprinkled with excrement.

The damage to grain on the cobs is likely to become more serious, though at present it is not very extensive. Recent reports from America show that in some years this pest can become overwhelmingly common and destructive to maize in the cob, it being reported from certain States in southern United States of America that it had increased and had done enormous damage, second only in seriousness to the common Angoumois grain moth.

The moth itself is very tiny and inconspicuous; it somewhat resembles the Grain Moth, but is smaller and more slender; rather light and greyish in colour; it cocks up the wings at the tail end when resting.

Remedies.—In the field no treatment except pulling at the earliest opportunity, and then fumigation in store is practicable. The infested cobs are best fumigated after removing and destroying the husks. Place the cobs or shelled grain in a tight-fitting and tightly-lidded barrel, bin, or box; unless it is very tight-fitting, escape of gas and disappointment in results is inevitable. Use 4 to 6 lb. carbon bisulphide to 1,000 cubic feet of space, or 1 to 2 lb. to 100 bushels of grain. Fumigate on a warm day, as the gas is most effective at temperatures above 70 degrees Fahr. Avoid fumigating in cold weather as the fumes are only partially effective under about 65 degrees. No flame or lighted pipe or cigarette should be brought near the fumes or into the building where the fumes are about, as there is great danger of the fumes exploding.

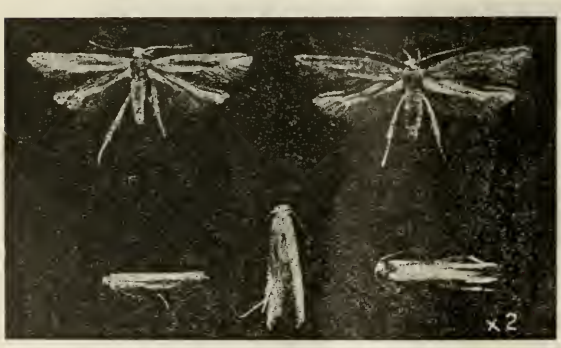

Fig. 5.—The Common Angoumois Grain Moth, the larvæ of which destroy maize and other grain, both in field and store.

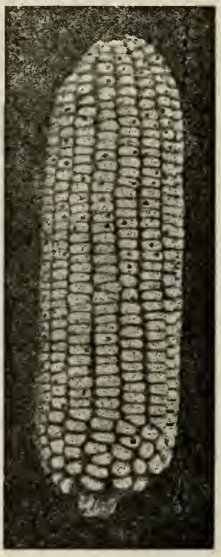

Fig. 6.—Typical damage due to Angoumois Grain Moth.

The Army Worm (*Cirphis* (*Leucania*) *unipuncta* Haw.). (Fig. 3.)

Food plants.—The caterpillars of this moth feed on grasses, wheat, maize, barley, rye, oats, millet, &c.

Damage.—Eat the foliage, sheath, and silk of maize. In the case of young maize may do so much damage as to stunt the growth or destroy the plants. When very numerous whole fields may be eaten down.

Localities.—Probably a native of America, where it is a serious pest. Now also established as a pest in Australia, Europe, and Asia.

The eggs.—These are laid by the moths in rows usually against the bases of the leaf blades. Hundreds, up to 700 eggs are recorded as laid by a single female. In summer the eggs hatch in eight to ten days.

The caterpillars.—When numerous may move in irregular swarms or armies from field to field. The tiny, newly-hatched ones may be of palest brown or dirty white, sometimes with greenish tinge, and longitudinal stripes on the back. The older caterpillars are darker and sometimes more definitely striped, but vary considerably to a dark brown or smoky black colour all over, with the characteristic dorsal longitudinal stripes scarcely showing. Become full grown in three to four weeks, and attain a length of 1½ inches. Coil up when disturbed.

The pupa or chrysalis.—Reddish brown, oval and smooth, just under ¾ inch long. It is usually found an inch or two below the soil surface, where the full-grown caterpillar has buried itself to change to the pupal or resting stage, in which it remains for about two weeks in summer.

Adult moth.—Buff or very light brown-coloured, with a single whitish spot with a dark surrounding patch or one or two distinct spots placed in the centre of the fore-wing; the hind wing paler, sometimes greyish or smoky on the outer half. On hatching from the pupæ in the soil they push their way up to the surface and expand the wings, and in an hour or two are able to fly about. The males are slightly smaller than the females. The moths fly at night, and are therefore rarely seen; sometimes they are attracted to lights at night. It is recorded by Walton that they fly some distance to lay their eggs. It is not definitely known where or how the majority of the army worms pass the winter. The majority of my specimens hatched into the adult moths by May and June, but were not observed to lay eggs though kept alive and fed for a week or two. It is probable that some of the moths hibernate, and some of the caterpillars partly grown may also hibernate, as also late pupæ in the soil.

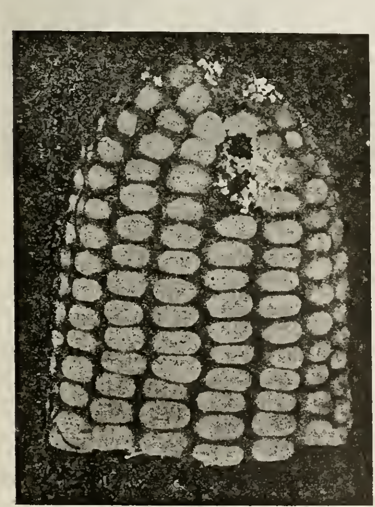

Fig. 7.—Top of cob showing the hole (surrounded by excrement) drilled by the larva of Yellow Maize Moth.

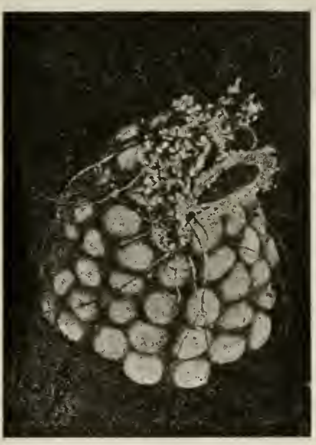

Fig. 8.—Tip of cob showing work of Yellow Maize Moth larva, with pupa *in situ*.

The ploughing and cultivation of the soil in winter exposes a percentage of the pupæ to birds, predaceous insects, and to the wet and cold weather, which reduces their numbers. In early spring the rank grass and weeds of the headlands of cultivation paddocks and elsewhere near the paddocks should be examined for the tiny young greenish caterpillars. These may be plentiful and unnoticed, being hidden deep down in the base of such grass. Such infested patches may either be cut down and shortly after burnt over, or sprayed with 1 lb. Paris green or 2 lb. of arsenate of lead to 50 gallons of water, taking care that stock is not able to gain access to the sprayed patches. Should the army worms be moving in masses in a definite direction, in front of them and between them and crops likely to be attacked, a steep-sided furrow should be ploughed; and as they fall in and accumulate readily in such a furrow, a log dragged along the furrow, or a spraying with oil, soap and water emulsion will kill the majority before they can reach the crop. The outer edge of a crop not intended for forage may be sprayed with the Paris green or arsenate of lead mixture as used for grass, but with 2 lb. of slaked lime added to prevent burning. Lastly, if the caterpillars have been unnoticed and have spread throughout a crop, the use of poisoned bait—1 lb. of Paris green to 16 lb. of bran made into a crumbly mash with water rendered slightly saline by the addition of salt—has been found successful. It seems likely that less Paris green may be used with success. Another formula which it is intended to test is 1 lb. Paris green or 9 oz. of white arsenic to 50 lb. bran, and the juice of six oranges or lemons, made into a stiff mash with molasses. The poisoned bait is scattered over the ground where the caterpillars are present in the crop, and at night the caterpillars move out of the soil where they frequently remain hiding by day, and feed on the bait, which poisons them. This method has been found very effective in barley crops, and should be effective in crops of young corn, though less so in older corn, where I find the grubs then mainly hide by day at the bases of the leaves and do not travel down as far as the soil.

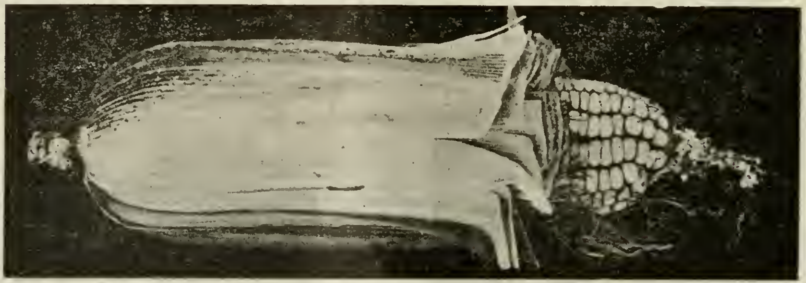

Fig. 9.—Cob damaged by larva of Yellow Maize Moth. The sheath has been cut away to show the "pipe" of silk and excrement at the tip of the cob.

List of Insect Pests of Maize in New South Wales, with brief notes on some species.

INSECTS WHICH ATTACK THE COBS OR THE GRAIN IN THE FIELD OR IN STORE.

Grain Weevil (*Calandra oryzæ* Linn.). (Fig. 4.)

Locality.—World-wide spread in warm and temperate climates.

Damage.—Most serious pest of maize grain. Attacks ears in field, but main damage occurs in stored cobs and grain.

Angoumois Grain Moth (*Sitotroga cerealella* Oliv.). (Figs. 5 and 6.)

Locality.—World-wide spread. Second only to Weevil in destructiveness.

Damage.—Sometimes as prevalent as weevil. Infests ears in the field, but stored cobs and grain afford opportunity for more damage by this moth, unless treated

Yellow Monolepta Beetle (*Monolepta rosæ* Black).

Locality.—North Coast districts of New South Wales and Queensland.

Damage.—Attacks leaves and the silk of young cobs, probably causing failure in fertilisation. Also attacks sugar-cane leaves and buds, the flowers and foliage of citrus and stone fruit trees, wattles, acacias, and of garden plants.

Yellow Maize Moth (*Conogethes punctiferalis* Gn.). (Figs. 7, 8, and 9.)

Locality.—North Coast districts of New South Wales and Queensland coast.

Damage.—The grubs attack cobs, damaging the cob core, grain, and silk; bore in shank and stem occasionally. They also commonly attack green peaches and sometimes sorghum heads.

Corn Ear-worm (*Chloridea* (*Heliothis*) *obsoleta* Fab.). (Figs. 10 and 11.)

Locality.—Almost universal where corn is grown.

Damage. — Grubs attack cob, sheath, grain, core and silks. Its damage opens up the cob for ready attack by weevil, grain moths, pink cornworms, various beetles, &c.

Pink Corn-worm (*Batrachedra rileyi* Wals.).

Locality. — United States, Hawaii, and now recorded for first time as common along the whole coastal districts of New South Wales from Dapto to the Richmond River; probably present in Queensland.

Damage.—Attacks cobs (grains, silks, husks and core), occasionally the tassels and leaves; also attacks sorghum heads.

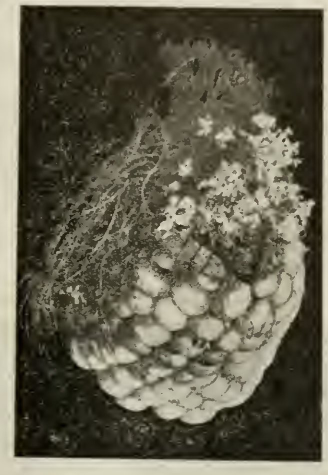

Fig. 10.—Tip of cob showing an "Ear-worm" *in situ.*

The following beetles have also been found in maize, a few of them on exposed ripe cobs in the field, but they are more seriously harmful in the stored grain (incidentally it may be noted they are all found amongst wheat), viz.:—

Red flour and grain beetle (*Tribolium ferrugineum*).
Broad-horned flour and grain beetle (*Gnathocerus* (*Echocerus*) *cornutus* Fab.).
Lesser grain borer (*Rhizopertha dominica* Fab.).
Saw-toothed grain beetle (*Silvanus surinamensis* Linn.).
The flat grain beetle (*Læmophlœus* sp.).
Meal-worm beetle (*Tenebrio molitor* Linn.).
The cadelle beetle (*Tenebroides mauritanicus* Linn.).
Carpophilus hemipterus.
Carpophilus sp.
Cryptophagus sp.
Typhæa fumata Linn.
Mites.

INSECTS WHICH ATTACK THE STEM OR LEAVES OF CORN.

Army-worm (*Cirphis* (*Leucania*) *unipuncta* Haw.).

Locality.—Introduced into Australia; now practically cosmopolitan.

Damage.—Attacks maize and all other cereals; if numerous, will destroy whole crops.

Yellow Maize Moth (*Conogethes punctiferalis* Gn.).

For locality and damage, see above.

Sugar-cane Borer Moth (*Phragmatiphila* (*Nonagria*) *truncata* Walk.).

Locality.—Native species of North Coast of New South Wales and Queensland.

Damage.—Bores into maize stems; is more serious as a sugar-cane borer. A new record as a maize pest.

Corn-leaf Aphis (*Aphis maidis* Fitch).

Locality.—Practically wherever corn is grown.

Damage.—Sucks sap of leaves, stem, and cob sheaths.

Coccids. A species of mealy bug (*Dactylopius* sp.).

Locality.—Clarence River, New South Wales.

Damage.—Found occasionally at bases of leaves and cob sheaths where they suck sap. Attended frequently by a small ant.

Rutherglen Bug (*Nysius vinitor* Berg.), and also various Grasshoppers (*Cyrtacanthacris locusta*, &c.).—Feed on the leaves.

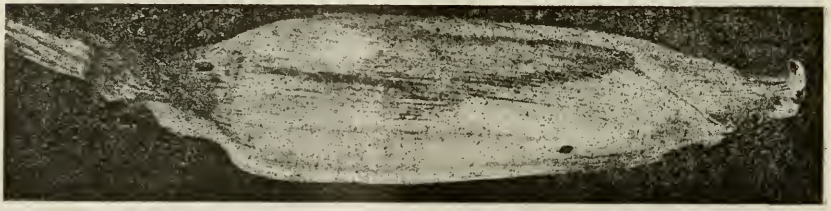

Fig. 11.—Cob showing two entrance holes bored through the sheath by Ear-worms, which then feed on the grain within.

INSECTS WHICH ATTACK THE ROOTS OR SEED IN THE GROUND.

"Wireworms," the grubs of beetles of the family *Elateridæ* (Click beetles).

Locality.—New South Wales and most parts of world. Different species affect crops in different countries.

Damage.—Feed on roots and seedling corn below the soil.

"White Grubs" (grubs of Scarab beetles).

Locality.—New South Wales and most parts of the world where corn is grown.

Damage.—Feed on the roots of maize plants, weeds, and grass.

Slender Seed-corn Beetle (*Clivina* sp.).

Locality.—New South Wales. Related species recorded in United States of America as doing similar damage.

Damage.—Occasionally reported as damaging seed-corn in the ground, the adult beetles eating out the germinating seeds.

Underground Maize Beetle (*Pentodon australis* Blackb.).

Locality.—New South Wales and Queensland.

Damage.—Adult beetle eats germinating maize seeds, and also seedlings; in Queensland damages sugar-cane sets.

Notes on the Quality of the 1918 Winter Pool Butter.*

A. M. BROWN, Dairy Instructor and Grader.

Now that the stocks of "Winter Pool" butter in New South Wales have been exhausted, a few notes on its quality, when released from cold store, may be of interest to factory managers and others.

Samples representing practically all this butter, with the exception of that exported to other States on behalf of the Commonwealth Government, have been graded by me on its release from storage, either on the selling floors of of Sussex-street, or on the grading floors of the different cold stores where it has been held.

As a result of these examinations, it is gratifying to be able to state that the quality generally was highly satisfactory, and has once more demonstrated most emphatically the value of pasteurisation in improving quality. It has been found that in the case of factories where this process is in use, the butter has retained its flavour in a remarkable way, even for three months, and has come out of cold store, in the great majority of cases, better than when it went in.

In support of this statement, figures which have been compiled by the clerical staff of the Dairy Branch may be quoted.

Of the 271 lots examined, 89, or about 33 per cent., were equal in quality coming out of cold store to when going in; 143, or about 53 per cent., had improved in cold store; and only 39, or about 14 per cent., were found to have fallen away in quality during storage. The figures with regard to the two systems of pasteurisation may be summarised as follows:—

System of Pasteurisation.	Quality.			Total.
	Similar.	Improved.	Lowered.	
Holding System ...	50	69	23	142
Flash ,, ...	39	74	16	129
Total	89	143	39	271
Percentage ...	33	53	14	100 per cent.

Further, even in the comparatively few instances where the quality of certain pasteurised butter had deteriorated to some extent, such deterioration was not sufficient to prevent its being used for table purposes.

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* We are indebted to the Commonwealth authorities for copies of initial gradings of this butter made prior to going into cold storage.

Doubtful Quality of Unpasteurised Butter.

Satisfactory as the quality of the pasteurised article was found to be, just the opposite was the case with regard to the untreated butter, which, with but few exceptions, had become second grade during storage. A striking peculiarity in this connection was that, where faults were found with the pasteurised product, flatness and an inclination to tallowiness were the predominant flavours, while with the untreated butter, oiliness, which is the first indication of fishiness, was always noticeable.

From these observations it may be concluded that pasteurisation is an undoubted remedy for fishiness; and it is also now made clear that there may have been some justification for the complaints with regard to this objectionable flavour in our butter, when it reached England, before this process became so general in New South Wales. The faults of flatness and inclination to tallowiness were, in my opinion, due in many cases to over-neutralisation of cream before its manufacture into butter, and could have been avoided in these instances by the use of correct methods in taking the acidity. This would have enabled an accurate calculation of the amount of neutralising agent necessary to reduce the acidity to the required percentage to have been made.

The use of a good starter would have nullified the effects of over-neutralisation to a great extent, by supplying the lactic acid flavour to the cream already made too alkaline, and afterwards giving the butter made from such cream that bright, natural flavour which at once distinguishes it from the flavour of neutral fat, such as tallow or lard.

These remarks and comparisons should help to convince those connected with butter factories which do not pasteurise that, until the necessary plant is installed and in use, they cannot hope to successfully compete—either on the local or English market—with those who have adopted this method, nor can they assist in the commendable endeavour to make the New South Wales butter equal, if not the superior, to the world's best.

LIST OF PLANTS DECLARED TO BE NOXIOUS IN VARIOUS SHIRES DURING JULY, 1918.

Plant.		Shire.
Scientific Name.	Common Name.	
Carthamus lanatus	Saffron Thistle	Rylstone.
Centaurea calcitrapa	Star Thistle	Rylstone.
Echium plantagineum	Paterson's Curse	Rylstone.
Hypericum perforatum	St. John's Wort	Rylstone.
Inula graveolens	Stinkwort	Gunning, Urana.
Nicotiana glauca	Wild Tobacco Plant	Rylstone.
Ricinus communis	Castor Oil Plant	Rylstone.
Rubus fruticosus	Blackberry	Holbrook.
Xanthium spinosum	Bathurst Burr	Rylstone.
Xanthium strumarium	Noogoora Burr	Rylstone, Jemalong, Kyeamba.

A Practical Application of Herd-testing.

L. T. MacINNES, Acting Dairy Expert.

PARTICULARS were given in the July issue of the results of testing dairy herds on the North Coast, in connection with the herd-testing movement governed by the Tweed-Richmond Herd-testing Council.

Details are now to hand giving the actual results obtained by one member of the Bangalow Herd-testing Association. These show in a practical manner the benefits to be derived from a proper application of the information obtained from production records of each individual cow.

These records, covering the two years ending 28th February, 1917 and 1918, are as follows:—

YEAR 1916–17.

Cow No.	Butter.	Milk.	Cow No.	Butter.	Milk.	Cow No.	Butter.	Milk.
	lb.	lb.		lb.	lb.		lb.	lb.
1	227	5,220	16	174	4,215	29	223	4,655
2	318	6,120	17	121	3,255	33	165	3,945
4	221	5,445	18	131	3,070	34	187	3,405
7	235	6,180	20	190	4,395	35	173	3,390
8	211	5,115	21	241	4,770	36	134	2,715
9	169	4,155	22	327	6,945	37	224	4,970
10	255	5,220	24	267	5,280	38	238	4,830
11	225	4,755	25	300	6,045	39	105	1,960
13	267	5,055	26	227	5,345	40	214	3,975
14	275	6,285	27	189	3,870	41	174	3,945
15	280	5,000	28	201	4,140			

Average, 212·12 lb.

YEAR 1917–18.

Cow No.	Butter.	Milk.	Cow No.	Butter.	Milk.	Cow No.	Butter.	Milk.
	lb.	lb.		lb.	lb.		lb.	lb.
1	236	5,055	22	289	6,435	41	230	5,055
2	304	5,730	24*	...	...	42	263	5,280
4*	...	...	25	267	5,820	43	205	4,365
7	262	6,720	26	208	4,785	44	354	6,070
8	365	8,355	27	232	4,840	45	287	5,730
9*	...	..	28	236	4,815	46	284	5,820
10	212	4,160	29*	...	...	47	432	7,980
11*	...	...	33	194	4,745	48	273	5,430
13	272	5,220	34*	...	...	49	227	4,335
14	358	7,050	35	318	6,880	50	182	3,210
15	380	6,750	36*	...	...	51	190	3,825
16*	...	...	37*	...	...	52	239	5,340
17*	...	...	38	238	4,755	53	264	5,370
18*	...	...	39*	...	...	54	202	3,990
20	200	4,645	40	789	14,565	55	350	6,690
21	220	4,455						

Average, 281·23 lb.

* See subsequent note *re* culling these cows.

It will be seen that in the first year thirty-two cows were tested, giving an average yield of 212·12 lb. butter. At the end of the year's testing seven cows—Nos. 9, 16, 17, 18, 34, 36, and 39—were culled out and disposed of;

the yields of these cows ranged from 105 to 187 lb. butter, and from 1,960 to 4,215 lb. milk, the average being 146 lb. butter and 3,253 lb. milk. In addition to these, five cows—Nos. 4, 11, 24, 29, and 37—were culled out for various reasons, although their yields for the whole year averaged 233 lb. butter.

In the following year thirty-four cows were milked, giving an average yield of 281·23 lb. butter, showing an increase of 69·11 lb. butter over the preceding year.

It may be noted in comparing these results that the records for 1916–17 were obtained under practically perfect weather conditions through the whole twelve months' period of testing, whereas the higher average was obtained under conditions by no means so good.

The nine cows already alluded to as culled out during the first year under review were taken from the herd prior to or on the expiration of the first six months' testing of that period. The record of the cow No. 40 is worthy of special mention; she was not in good form throughout the testing period 1916–17, and was dried-off towards its end, having yielded 3,975 lb. milk and 214 lb. butter. She freshened again in April, 1917, and up to the 28th February (eleven months) she is credited with a fine record of 14,565 lb. milk and 789 lb. butter. During this period she was in fine condition, being completely restored to health. This goes to show how careful a dairy farmer must be in applying the information he obtains from his testing records, before coming to any decision as to a cow's productiveness. The condition of her health and the amount of food, and general conditions under which she is milked during the testing period, should always be taken into consideration.

The owner of this herd, Mr. E. Murray, is an enterprising young farmer in the Bangalow district, and is a firm believer in the benefits to be derived from testing his milking cows for productiveness. Not only does he obtain the testing records, but he applies them in a practical and commonsense manner; and his experience is a demonstration to others of what can be done by this means in uplifting the average yield of a dairy herd in a very short time.

The average yield of butter from this herd for the twelve months ending 28th February, 1917, was by no means a low one, taking into consideration the average returns obtained from the dairy stock of the State. To have increased this yield by nearly 33 per cent., and brought the herd average up to 281 lb. butter, at the same time increasing the number of cows milked from thirty-two to thirty-four is a very creditable performance, and could only have been done in such a short space of time with the assistance of records obtained from properly and systematically testing each individual cow in the herd.

In obtaining these results Mr. Murray has kept in mind the principal points of breeding on production records; that is, he has used at the head of his herd a pure-bred dairy bull of undoubted production strain. He has culled out the low producers, and has substituted in their places the heifers bred from his best yielding cows.

What this farmer has done can be achieved by others, and his example is recommended for earnest consideration and adoption by other dairy farmers in the State. In view of present conditions, it is essential that every means be utilised to greatly increase the average yields of our dairy stock as quickly as possible.

I am indebted to Mr. N. Wilshire, Secretary of the Tweed-Richmond Herd-testing Council, for the details and records of this herd.

"The Food of Australian Birds."

The recently-issued Science Bulletin No. 15, under this heading, is devoted to a record embodying the results of an investigation into the character of the stomach and crop contents of Australian birds. The authoritative nature of the work may be gathered from the names of those responsible for it—Dr. J. B. Cleland, Principal Microbiologist, Department of Public Health ; Mr. J. H. Maiden, Government Botanist and Director of the Sydney Botanic Gardens ; Mr. W. W. Froggatt, Government Entomologist ; Dr. E. H. Ferguson, Assistant Microbiologist, Department of Health ; and Mr. C. T. Musson, Lecturer in Botany and Entomology, Hawkesbury Agricultural College. A number of other workers—laymen and scientists—have been associated with the authorities mentioned above ; and the work of obtaining different species of birds from different parts of the country, classifying them, and examining and identifying the contents of the stomachs and crops, has extended over a considerable number of years. Many hundreds of birds have been so handled, and each department of the work has been attended to by a specialist in that particular function. The result is a work of very considerable and lasting value. It is not pretended that the records are exhaustive or complete. But what has been done has been done with the care and the thoroughness for which one looks in anything that comes from the hands of true scientists.

As a work of reference alone this record of a scientific investigation of the food of Australian birds is invaluable, while as a basis for future, and still more extended investigation, it is useful and important in the highest degree. Indeed, the work is of such national value from the economic point of view that it deserves to be printed in a more imposing and permanent form than as a mere departmental bulletin. The compilation of this booklet has entailed a very great amount of patient labour by skilled hands, and the scientists responsible must be congratulated on the production of a work of national importance in its bearing on the economic value of birds. The whole of the information contained in the booklet—and it is most comprehensive—has been arranged in detailed form, and the results of the examination of the contents of the crops and stomachs have been tabulated, together with the species of bird examined, the locality from which it comes, and the nature of the animal or vegetable food upon which it is found to subsist. There is some interesting comment on the economic value of the crow and the starling, and the importance of many other species of birds such as the ibis, the wood-swallows, the magpies, the magpie larks, the tits, the flycatchers, cuckoos, chats, thrushes, wrens, robins, &c., is clearly set out and established in relative form. Some of the results given have been published before in *The Emu* and the *Agricultural Gazette*, but they represent only a small percentage of the birds since dealt with and included in this publication.

The highly important work of educating the public as to the value of bird life in this country has been hampered by absence of proven detail as to the actual characteristics of different birds, what insects, and the quantity, they destroy. To a large extent this bulletin meets this deficiency, although more work of actual investigation—as on the lines adopted in the United States with splendid effect upon the public mind—is required. In the meantime, it is most necessary that full advantage should be taken of the information made available in the bulletin under notice, and the authorities should consider the advisability of this bulletin being placed in the hands of our country school teachers, and its contents imparted to the school children To teach the country boy, who will probably spend his life on the land, the actual characteristics—good or bad—of the native and imported birds is education of a direct and practical value, and if necessary it would be possible to eliminate other subjects, with a consequent benefit to the boy and the community.—*Sydney Morning Herald.*

[Copies of this bulletin may be obtained by residents of New South Wales, free, on application to the Under Secretary and Director, Department of Agriculture, Sydney.]

WARNING *re* GRASSHOPPER SWARMS THIS SUMMER, 1918–19.

THE attention of pastoralists and farmers of the Upper Hunter River and Coonamble districts is called to the fact that last March and April swarms of grasshoppers were noted as depositing eggs throughout these districts, and that, normally, the over-wintering eggs should be hatching in September. These eggs are laid in patches, usually of a few hundred yards extent. The tiny hoppers, hatching on such scattered patches, should be watched for, and sprayed at once before they grow larger or spread. As the tiny wingless hoppers feed and grow they will spread and become more destructive, and in six or eight weeks hence will be winged, forming the first winged swarms about November. These winged swarms spread, lay more eggs, which give rise to enormously increased swarms of hoppers, and incidentally the grass and crops will suffer severely.

It must be emphasised that one cannot predict for certain whether the swarms this year will be particularly numerous, as winter rains, predaceous enemies, &c., may have destroyed numbers of the over-wintering eggs now in the ground; but it is wise to prepare for possible swarms. Obviously control measures should aim at destroying the first and smallest swarms of hoppers hatching now, and not wait until they have spread and increased. Egg patches should be sprayed, burnt over, or otherwise treated within the first week, or at least the first fortnight, after hatching, because then the insects are massed together, and more easily killed than when older.

The treatment recommended is as follows, and it is proposed to conduct tests with these and other methods during the coming season:—One pound arsenite of soda is mixed with 16 gallons of water and 3 or 4 lb. treacle or sugar, and sprayed in a fine mist on the patch where the young hoppers are hatching. This poisons the grass and kills the hoppers within four days. Due care should be taken to keep stock away from recently sprayed patches. In South Africa this has been found exceedingly successful, and, with care, not harmful to stock. It is suggested that as arsenite of soda supplies are limited in quantity, arsenated soda (not arsenate of soda) at 1s. 3d. per lb., or 75s. per cwt., which can be obtained might be tried, using 18¼ oz. of arsenated soda in lieu of 16 oz. of arsenite of soda, as in the above formula. This is based on analyses made by Mr. Ramsay, the Assistant Chemist, Department of Agriculture.

The use of oil and soap washes is almost prohibitive at present prices, and has not been found so successful; and other methods for use in limited areas, with due precautions, are the use of flares, or else burning dry grass over the beds of hatching eggs, ploughing furrows to stem and collect moving hopping swarms, &c. For adequate control, however, organised attacks throughout each affected district, employing sprayers and the arsenic wash, have been demonstrated as capable of controlling larger swarms and over more extensive areas than we normally have to face in New South Wales.

Despite the present scarcity of labour, and any other factors which may make treatment difficult, there is every reason for recommending that these control measures be carried out.

Immediate notification of the appearance of the first batches of hoppers is asked for, and further information will be given.—W. B. GURNEY, Assistant Entomologist.

Studies in "Black Disease."

A BRAXY-LIKE DISEASE OF SHEEP.

SYDNEY DODD, D.V.Sc., F.R.C.V.S., Veterinary Research Laboratory,
University of Sydney.

FOR about fifty years a disease affecting sheep, and resulting in considerable mortality, has been known on the Southern Highlands of New South Wales, but it is not until 1895 that any official records appear of attempts being made to investigate its etiology. The early records are very meagre, and throw little or no light upon the subject except as regards its distribution and the lesions associated with it.

In 1895 Mr. S. Pottie, M.R.C.V.S., of Sydney, made an investigation, and suggested that the disease be called Braxy, apparently on account of its clinical resemblance to the European disease of that name. In his report, however, no description of the symptoms, lesions, &c., was given.

In 1901 Professor J. D. Stewart, then Government Veterinary Surgeon, visited the locality of an outbreak. He, however, submitted no report, and said that he was unable to make any definite statement as to the nature of the disease.

In 1901 appears the first official record of the name "Black disease," when the Stock Inspector at Cooma submitted specimens from dead sheep to the Government Bureau of Microbiology for examination and opinion. The result was negative.

The first official record of experimental inoculations in the endeavour to transmit the disease artificially occurs in 1902, but no results are given, nor is the nature of the inoculations stated. One must conclude that they were negative.

Attention, somewhat later on, was drawn to an article in the *Sunday Times* (Sydney) by Dr. Brown, of Melbourne, describing a disease of sheep in Victoria, apparently similar to Black disease, and in which he stated that he had found the causal organism. He named the condition pneumoenteritis. The claim was not substantiated.

In May, 1908, Black disease was reported in the district of Goulburn, twenty-five sheep having died (two or three every few days). No account of autopsies, however, appears in the report. Smears examined by the Bureau of Microbiology were negative as regards ascertaining the cause.

In May, 1909, thirty wethers out of 2,400 died near Braidwood. They had been depastured at Yass on the Southern Highlands from February until April. The Stock Inspector suspected Black disease. At the end of the month the sheep were still dying at the rate of two daily. In this year the State Bureau of Microbiology began a systematic examination of specimens taken from sheep dead of this disease, but the efforts to ascertain the cause of the condition failed.

During the same year Mr. M. Henry, B.V.Sc., M.R.C.V.S., investigated an outbreak in the Goulburn district, and reported that 500 out of 3,000 sheep had died. The mortality on this special sheep station occurred every year from May to September. In a few cases the affected animals showed symptoms of illness a day or so before death. He found a ewe apparently just dead. The following is his account of the post-mortem examination:—"Skin and subcutaneous tissues ecchymotic; considerable peritoneal fluid; some bile staining of the intestines; stomachs normal; intestines distended with gas; spleen slightly enlarged and softened; liver rather soft and friable; gall bladder distended; lungs slightly congested; some pleural effusion; pericardium distended with a pale, clear, straw-coloured fluid."

Mr. Henry stated that the above were the usual lesions found in this disease. Post-mortem decomposition was very rapid, and sheep died without a struggle. The report is headed "Report on Braxy-like disease known as 'Black Disease' in sheep."

From 1909 to 1913 the State Bureau of Microbiology made various experiments with guinea-pigs and rabbits, and also with a sheep, but were unable to produce "Black disease." Some feeding experiments were also made upon sheep with minced-up intestines from sheep dead of the disease, but without result. At the bureau also, various organisms were isolated from material sent for examination, but none of them could be associated with the cause of the disease. Apparently they were post-mortem invaders. It was also stated that "Gilruth's bacillus" could not be detected.

In 1913 officers of the Bureau of Microbiology made a large number of autopsies in the field, upon sheep dead from "Black disease." The work was of value, in so far as a knowledge of the lesions was concerned, but no light was thrown upon the etiology of the disease.

The foregoing abstracts are taken from officially reported cases of Black disease. They represent a very small fraction of the cases actually occurring.

Two explanations as to the origin of the term "Black disease" are given, viz.: (1) On account of the dark appearance of the liver of animals dead of the disease; (2) because of the dark colour assumed by the under-surface of the skin soon after being taken from the body. The latter explanation is the one given me by stock-owners; and certainly, on account of the congestion of the subcutaneous vessels, the skin does assume an unusually dark appearance after removal, especially when contrasted with the skins of sheep dead from other causes. Indeed, some owners diagnose the condition by the colour of the skin when removed.

Distribution of the Disease.

In New South Wales it appears to be confined to the Southern Highlands. It has been reported in localities outside this area, but in the authenticated cases the sheep had recently come from areas in which Black disease is enzoötic. There appears reason for believing that the disease is slowly spreading. On the other hand, however, this may be more apparent than real, and due to the fact that more attention is being drawn to the condition. Furthermore, there is a tendency for many stock-owners in certain areas, when sheep die unexpectedly, to attribute the fatality to Black disease, whatever the real cause may be.

A very similar condition occurs in Victoria on similar country. Dr. Gilruth, who investigated the Victorian disease, considers that the two conditions are probably identical.

In its clinical features it also resembles a braxy-like disease of sheep in Tasmania.

Finally, its clinical features and lesions resemble the disease in sheep in Europe known as Braxy or Bradsot.

Seasonal Occurrence.

The period of the year during which mortality occurs from Black disease varies somewhat, apparently in relation to climatic conditions. In the Monaro district of the Southern Highlands, where the winters are, for Australia, fairly severe, the elevation being roughly between 2,000 and 4,000 feet, the disease usually makes its appearance about February (late summer), and lasts until about May (early winter). As a rule, the mortality is stated to cease to a great extent with the onset of frosty weather, although a few sheep may die at irregular intervals throughout the winter. In 1914 I saw numbers of sheep dead from the disease in paddocks which were heavily covered with frost.

Apparently, in a wet, warm winter the mortality is almost as heavy as in the autumn. It is quite possible, also, that occasional sheep may die at any time of the year; but on account of the large size of the flocks and the large areas over which the sheep graze, no special attention is drawn to the death of an odd animal. In other localities more inland, in what might still be termed the Black disease area, where the winters, although fairly cold, are not so severe as in the Monaro district, the disease apparently begins to make its presence noticeable about May, and continues till about September (the winter months).

It is enzoötic in character, but, although it may be seen more or less upon certain sheep stations every year, its incidence in any particular paddock is very erratic. A number of cases may occur in a paddock one year, whilst in the following year, in the same enclosure, there may be none, or only an occasional case. Some affected areas are also sharply demarcated from areas in which the disease is seldom or never seen. Not uncommonly the boundaries of such areas are artificial, *e.g.*, fences, walls, &c., whilst the geological conditions are identical. The water supply, too, may be the same, *e.g.*, a creek flowing through, or a lagoon fronting both paddocks.

As an instance of the foregoing, in 1916, on a station running 26,000 sheep, 250 died in a paddock containing 1,600. Of the remaining 24,400 sheep, none were said to have died from Black disease, although some of the paddocks were adjoining the former.

This erratic character in the appearance of the disease from year to year will explain why it is that almost every remedy used by various sheep-owners claims to have success in preventing the occurrence of Black disease.

Age Incidence, &c.

There does not appear to be any special age at which the disease occurs. In some districts it is said to affect principally sheep between 1 and 2 years old. In the Monaro district, where most of my own investigations up to the present have been conducted, the mortality is principally among adult sheep. In this instance it may be because the young animals are not so exposed to infection, *i.e.*, are not grazing in infected paddocks.

The condition is seldom seen in animals under 1 year old, although in the Goulburn district, in the season 1916, young lambs from 6 to 12 weeks old were dying in a notoriously infected paddock. I saw two just prior to death, and the clinical symptoms and post-mortem appearances were identical with Black disease.

The sheep affected are invariably in good condition.

Sex does not appear to play any part. In 1914, on one of the stations on which my researches were being conducted, the mortality was chiefly amongst wethers; whereas in 1915 ewes were run in the same paddocks as the wethers of 1914, and they suffered heavily. Rams have no immunity.

The disease appears to be peculiar to sheep, no cases having been observed in other animals, although grazing in paddocks known to be badly infected.

Mortality.

This varies considerably every year, even on the same station, the various factors influencing the incidence of the disease not yet being clearly understood. The statements of various sheep-owners are often completely at variance with each other; in some flocks the mortality is from 15 to 30 per cent. per annum, while in others only a few may die during the season. Most stock-owners are of opinion that once a sheep is affected, death is certain to result. This is probably because they seldom know that an animal is affected until the disease is not far from a fatal termination. My own experience leads me to the opinion that recoveries do occasionally take place. In 1915, on three stations the loss from Black disease was 3,000, 1,200, and 500 respectively, the percentage mortality being heaviest in the last; whilst considerable losses were experienced elsewhere. That year, however, was an unfavourable one for stock generally, on account of drought. It is impossible to obtain any true estimate of the actual death rate from Black disease, as owners in the majority of cases conceal their losses for various reasons, and some even deny its existence at all, although one is aware that sheep are dying in their paddocks. It is quite certain, however, that the direct annual loss from this disease amounts to thousands of pounds; one investigator has estimated that the direct and indirect annual loss amounts to at least £100,000, and that estimate was made when sheep and wool were very much cheaper than at present.*

Symptoms.

As a rule, and unless the sheep are watched closely all day, no symptoms are observed, the animal being found dead in the morning on the spot where the flock had camped during the night. On large sheep stations, where the paddocks are of considerable size, sheep have predilection spots where they sleep, although during the day they may graze over the whole of the paddock. Consequently, these are the places where one usually finds the majority of the dead animals. At the same time, however, deaths do take place during the day in various parts of the paddocks, although far fewer than during the night; but on account of the great area to be covered, and the nature of the ground, the bodies are frequently overlooked and the actual losses are not ascertained until the monthly count of the flock. Nevertheless, if the flock be carefully watched, the sick animals do show some signs of illness prior to death, although such signs are not marked, and may very readily be overlooked. Furthermore, as a rule, even with the greatest vigilance, the period elapsing between the first discovery of symptoms and death is not more than a few hours, frequently less than an hour. At times it is a matter of minutes only.

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* At the present time when prices for sheep and wool are so high, it is safe to say that this loss of £100,000 may be multiplied four or five times, and yet be considered conservative.—S. D.

A point to be held in mind is that there is a considerable difference in the behaviour of sheep which are kept in small areas and accustomed to the presence of human beings, as in Europe, and those living in large paddocks, often miles in area, as in Australia. The latter animals are semi-wild, and it is practically impossible to get near them on foot, and even when the observer is mounted, the sick animals, although seriously ill, will make endeavours to avoid close observation, and try to keep up with their fellows as they move about the paddocks. Consequently, the careful minute study of initial symptoms in the field is exceedingly difficult, and it is not practicable to keep a flock of several thousand sheep penned up in a yard for any length of time.

During my investigations in the field, in 1915-16 and since, it has been my practice to closely watch the grazing flocks from daylight to dark, following them about the paddocks as they graze, without disturbing them in any way. Even with such measures cases are very difficult to detect in the early stages. As a rule they are not discovered until the animal is not very far from the point of death. In some cases the immediate cause of death appears to be cardiac embarrassment, resulting from pressure of pericardial exudate, combined with the exertion required by the endeavours of the animal to keep up with its fellows as the latter are grazing during the day, or moving off to their camping ground in the evening. On several occasions a sheep apparently near the point of death, placed in a shed, where it has been compelled to keep quiet, has been found the next morning, to outward appearances, quite recovered, and subsequently has been released.

If the flock be watched carefully, an affected animal will be observed to lag behind the others in their migrations about the paddock, although until the last it will always strive to keep up with the remainder. At first this appears to be accomplished with little or no undue effort, but gradually the periods of rest become more and more prolonged, and the efforts to keep up with the flock more pronounced. As a rule, when mixing with the rest of the sheep, the sick animal makes no attempt to feed, yet even this is not constant. Some sheep have been seen grazing, and a few hours later, dead.

Instead of standing with the usual alert attitude when human beings are near, the affected sheep usually appears rather indifferent to its surroundings. When moving on uneven ground the animal will at times be observed to stagger a little; finally it lies down and ceases to attempt to follow its fellows. At this stage, on being approached, the animal may or may not make an attempt to escape; it depends upon how far the disease has progressed. Generally speaking, it will be seen that until the final stages there is nothing to attract the attention of the casual observer, except that the animal permits its fellows to get further and further away, a thing which a healthy sheep living under these conditions will seldom do. When a sheep lies down finally, it does so very quietly, and there are no attempts to struggle or regain its feet.

As an illustration of the foregoing, several owners have told me that they have never seen a sheep sick from Black disease, but have always found the animals dead, principally in the morning.

The temperature when the animal is first discovered is usually elevated—between 104 and 107 degrees Fahr.; the latter temperature, however, is more frequently seen at the moment just preceding death. There is no marked injection of the visible mucous membranes. The respirations are shallow. The condition of the pulse affords little or no information in these half-wild and exceedingly timid animals. If the sick animal be kept in an enclosure it may evince a little restlessness, but this may be merely from a desire to regain its fellows. Later on, the respirations frequently assume the Cheyne-Stokes type. The animal lies down, if it has been standing, and dies with hardly any movement; consciousness, however, appears to be preserved until the last.

Usually the time elapsing between the appearance of marked symptoms and death is short; as a rule, about half an hour or an hour.

(*To be continued.*)

PURE SEED MAIZE FOR SALE.

The Department of Agriculture has a limited amount of pure *selected* seed maize for sale for the coming season, both for grain and fodder purposes, as follows:—

Variety.	Seed available at—	Railway Station or Wharf.
Improved Yellow Dent Leaming	Grafton Experiment Farm	Grafton.
Red Hogan	Hawkesbury Agricultural College ...	Richmond.
Early Yellow Dent	Glen Innes Experiment Farm... ...	Glen Innes.

The price is 7s. 6d. per bushel f.o.r. or f.o.b. at the station or wharf mentioned. Bags, 9d. each extra.

As the supply is limited, intending purchasers are recommended to apply at once direct to the respective Experiment Farms, but inquiry should be made to ascertain whether the required quantity is in stock before remittance is sent. All orders should be accompanied by remittance, with exchange added for cheques.

Experiments on the Control of Brown Rot in Stone Fruits.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

DURING the months of January and February experiments were carried out on the control of Brown Rot on peaches and nectarines, after being packed in cases. Arrangements were made for the despatch of three cases each week from two different fruit-growing centres, viz., the Hawkesbury River and Richmond. In each instance one case was packed in the ordinary way, and considered as a check. The other two cases were treated with formalin and sulphur dioxide respectively, a saturated solution being used in each instance. The method of application was as follows:—A piece of cotton-wool was dipped in the solution, squeezed, and then placed in a small wooden box with perforated sides. This box was packed in the fruit case along with the fruit; the vapour of the formalin or of the sulphur dioxide diffused out through the perforations among the fruit. On arrival, the boxes were opened and examined. They were kept for two days, and the progress of the disease noted. Fortunately, as far as the experiment was concerned, Brown Rot was very prevalent, and some of the fruit in the untreated case had never failed to develop Brown Rot. Consequently, this case could always be used as a check. In the cases treated with formalin and with sulphur dioxide the number of fruits affected with Brown Rot was very much less than in the check case. But these two fungicides had inherent defects; both of them destroyed the natural bloom of the fruit, especially that of the peaches.

With sulphur dioxide the skin was, to a great extent, bleached, while with formalin the skin was much darkened in colour. These effects were more noticeable the nearer the fruit was to the small perforated wooden box containing the fungicide. The experiment of using weaker solutions was therefore tried. The formalin and the sulphur dioxide solution were diluted with 4 parts of water to 1 of the fungicide before the cotton-wool was dipped into the solution preparatory to being placed in the fruit case. Here again the sulphur dioxide solution and the formalin prevented the development of Brown Rot to a great extent, but the fruit was still bleached by the sulphur dioxide and the skin browned by the formalin vapour. In the latter case development of the objectionable colour was slower.

A consideration of the whole experiment leads to the conclusion that it will not be worth while to follow up the work on the lines so far pursued, for, although the development of Brown Rot in fruit in the case was greatly retarded, this advantage did not compensate for the loss of the fresh, natural bloom and colour of the fruit which the use of the fungicides brought about.

The most likely method of controlling Brown Rot appears to be by attacking it in the orchard, by means of sprays. As peach foliage is particularly liable to spray injury, the sprays should be applied in the winter, the object of the spray being to kill the spores of the fungus before the development of the foliage and fruit.

All parts of the peach above ground are liable to attack, and the fungus over-winters in the "mummied" fruit and in the cankers in the limbs.

The "mummies" frequently remain hanging on the trees; these should be picked off and burnt, together with those that have fallen to the ground.

Cankers on large limbs should be cut out and the wounds painted over with Bordeaux paste. Affected branches of small size may be pruned out. All prunings should be burnt. The trees should be sprayed twice with Bordeaux mixture (6—4—22), once during the winter, and again just before the blossoms open.

PURE SEED MAIZE—CO-OPERATION BY FARMERS.

OWING to the value of acclimatised seed maize, and the danger of its becoming impure in cross-fertilisation, it has been the policy of the Department, in order to ensure pure seed being available to farmers, to have only one variety grown at each Experiment Farm, where it undergoes systematic improvement for yield and quality.

As these Experiment Farms are not representative of every large maize-growing district in the State, the principle has been extended to include other districts, where this improvement system has been undertaken, under Departmental supervision, by the co-operation of reliable farmers in these districts.

In order to further extend this work and to cater for other important maize-growing centres, the Department would be glad to hear from farmers who are already specialising in, or who are willing to specialise in, the production of pure seed maize by co-operation with the Department.

The object of this is to get one or more reliable farmers in each district where there is no Experiment Farm to grow pure seed maize of a variety which is suited to the district, so that he can supply pure seed of good quality to farmers in that or any other district who may require it.

As varieties of maize cross-fertilise very readily, this would entail the growing of one variety only, or ensuring that this variety is not crossed by others, so that it may be kept pure.

A special seed plot, about an acre in area, planted with the best selected ears of the variety would be required, and where possible this plot could be utilised as an ear-to-row test or experiment to determine the best yielding types of ears of the variety. At the same time the variety would be improved in yield and quality.

Tests have shown that the yield of a variety has been increased by 10 bushels per acre by this system.

All communications should be addressed to the Under Secretary and Director, Department of Agriculture, Sydney.

Bracken Poisoning in Cattle.

From the *Journal of the Board of Agriculture*, England.

A PAPER recently published by Sir Stewart Stockman, the Board's Chief Veterinary Officer, deals with suspected deaths of cattle through bracken poisoning which have been reported to the Board in recent years. Investigations as to the effect of feeding cattle on bracken have been made at the Board's Veterinary Laboratory. The deaths were found to occur in the autumn; but the evidence against bracken was only circumstantial, and depended mainly upon the observations that the animals had died, and that they had eaten, or had had the chance of eating, bracken. The symptoms were, generally, a high temperature, loss of appetite, a trickling of blood from the mucus membranes of the eyes, nostrils, and vagina, passage of very dark and foul dung, sometimes mixed with blood clots, blood-swelling under the skin, occasional lameness, and finally coma; while lesions, consisting of hæmorrhages, were observed in different parts of the body on post-mortem examination. Death usually occurred from twelve to seventy-two hours after the first appearance of the symptoms. It was pointed out that the symptoms and lesions of the diseased condition were so constant that it was highly probable that they were due to the same agent in every case.

There was a good deal to be said against the view that these outbreaks were due to eating bracken. The number of animals visibly affected, although considerable, was small in proportion to the distribution of the weed around pastures; and it was observed that in herds of cattle in which the disease had appeared, cases might continue to arise for about a fortnight after the survivors had been removed from the pastures and excluded from further contact with bracken, thus diverting suspicion from it. There was also the probability, suggested by the constant symptom of very high temperature, that the outbreaks were due to contagion rather than poisoning.

From the first experiments carried out, the direct evidence in support of the suspicion of death from bracken was far from satisfactory. In two experiments, in which two heifers were fed respectively on 56 lb. bracken over a period of nine days and 60 lb. over a period of seven days, negative results were obtained, but it was thought possible that too small an amount had been consumed over too short a period. At a later date a further experiment was undertaken, with a view to testing the effect of prolonged feeding of comparatively small quantities of bracken given with other food. A bull calf over a period of twenty-nine days received approximately 260 lb. of the fronds of green bracken (about 10 lb. per day with other food). This resulted in a fatal termination. The animal showed identical symptoms during life, and identical lesions upon post-mortem examination, to those seen in cattle dying in the field of practice of suspected bracken poisoning. It is concluded to be not improbable that bracken contains a small amount of a poison which is able to accumulate in the system, and which requires a certain time to produce its full effects, after which severe illness may begin in an explosive manner, maybe some weeks after the poison has been withheld. It is also pointed out that until bracken has been submitted to an exhaustive chemical investigation, only suggestions can be made regarding the toxic principle.

Since the distinct symptoms appear suddenly, and do not seem to arise until the poison has definitely produced its action on the system, it is highly improbable that any therapeutic measures would be successful in declared cases. Preventive measures, however, even at this stage of our knowledge, offer some promise of success, notwithstanding the difficulty of eradicating bracken from pastures, or discontinuing its use as a litter in some districts (it has no great value as a foodstuff). It seems probable from practical observation that individuals vary in susceptibility, since some cases develop later than others in the same herd; some animals on the same pasture even seem to be highly resistant, and may not show the least sign of illness whilst others are dying around them. It is at least possible that the former animals have acquired resistance by a natural process of immunisation, as may happen in the case of poisons of the ricin class, and that only those succumb which have too brusquely and continuously fed upon the poisonous substance, with the result that they are fatally attacked before acquired resistance can establish itself. It is important to bear in mind that the poison does not develop its explosive potentiality for some weeks, and that the feeding must be continuous up to a certain point to bring it about. Given, then, a declared case of poisoning, or evidence that cattle have been continuously browsing the green fronds of bracken at pasture (and this should be looked for in the autumn), or that they have been freely consuming bracken given as litter,* no time should be lost in interrupting the continuity of this feeding by changing the pasture or litter, as the case may be, and giving the animals time to excrete the accumulated poison from the system before re-exposing them to contact with bracken, if it be necessary to do so. The administration of oleaginous purgatives may also help in the excretion of the poison.

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* It has not yet been definitely settled that bracken is poisonous to cattle after drying, though it seems wise to assume on the evidence that it may be.

THE FEEDING OF FOWLS WITH BLUESTONED WHEAT.

AT the end of the sowing season farmers occasionally have a few bushels of seed wheat which has been bluestoned and limed in readiness for sowing, but which, through climatic or other unforeseen conditions, has not been planted. The question then arises: Can such wheat be profitably utilised, and in particular, can it with safety be fed to fowls?

As nothing was known of the effects of bluestoned wheat on fowls, the Department decided, at the suggestion of the Poultry Expert, to conduct an experiment at the Hawkesbury Agricultural College.

For this purpose three pens, each consisting of twelve Rhode Island hens (all hatched in 1916), were arranged for on 17th June, 1917. Each pen received the ordinary morning mash, while the evening ration was as follows:—

Pen A.—Wheat which had been dipped in a 1½ per cent. solution of bluestone, and subsequently limed (in accordance with the usual Departmental formula);

Pen B.—Wheat which had been dipped in a 1½ per cent. solution of bluestone, and not limed;

Pen C.—Ordinary College ration of two-thirds wheat and one-third maize.

The Poultry Instructor at the College (Mr. A. L. Wyndham) reported that—

1. The treated grain in Pens A and B was always readily eaten;
2. The daily consumption of grain per bird in the three pens was equal
3. The egg production from the three pens to 28th February, 1918, was Pen A, 977 eggs; Pen B, 976 eggs; Pen C, 939 eggs;
4. The size, shape, and appearance of the eggs were normal;
5. The health of the birds was generally good throughout. No effects were observed in the excreta from the continued use of the sulphate of copper.

Hens from the A and B pens were sent to Dr. S. Dodd, of the Veterinary Research Laboratory, Sydney University, and in a report he stated that none of the birds (fed on bluestoned wheat), autopsied by him, showed any particular outward signs of ill-effects from such feeding, but in one or two instances distinct changes in the liver and slight changes in the intestines indicated that the continued administration of sulphate of copper, even in small doses, had begun to produce undesired effects. Animals and birds can tolerate relatively large doses of copper when given in small quantities at a time, but it has a cumulative action, and eventually will result in changes of a pathological nature in certain parts of the body. It appeared to him that one or two of the fowls in question were on the border line between good and ill health.

The general conclusion that may be drawn from the experiment is that while the feeding of bluestoned wheat to fowls cannot, of course, be recommended as a general thing, the necessity for economy at such a time as the present may justify the practice. Provided that the grain treated in accordance with the Departmental formula is fed as part of the ration only, no substantially ill-effects are likely to result—even when such feeding extends over a period of six or eight months—when the birds are in normal health at the outset, and are kept under satisfactory conditions.

Poultry Notes.

SEPTEMBER.

JAMES HADLINGTON, Poultry Expert.

THE weather conditions during the past month have not been the most favourable, either for egg production or for breeding, consequently a good deal of complaint is heard about poor fertility and poor hatching results. To a certain extent this is a normal condition during the early months of an ordinary season, but in the case of wet weather, such as has been experienced this year, the trouble is accentuated. It follows, too, that the difficulties in rearing are greater than when better weather prevails during those months. However, with the better rearing equipment that is now being installed on many farms, it is unlikely that the wastage in chickens will be so great as in former years in which similar weather conditions have prevailed.

The Outlook for Poultry Farmers.

Notwithstanding the continued high values for poultry foods, the immediate prospects for the poultry farmer are not unpromising. The shortage of the meat supply is creating a greater demand for eggs and table poultry, which in turn should result in better prices being obtained. In regard to the latter, poultry-keepers will do well to pay more attention to producing a better class of table bird.

Table Poultry.

The time has arrived when it is likely that table poultry will pay even better than in the past, but when, perhaps, egg-production will be less profitable in proportion, until conditions in regard to shipping facilities again become normal.

Recently the writer has been quoted as having said that table poultry does not pay. This is not in accordance with the facts. A careful perusal of pages 76 to 85 in "Poultry Farming in New South Wales" (Second Edition) will show exactly what was said on the subject. One statement in that publication is that I know of no success in specializing on table poultry. I have repeatedly advised poultry farmers against treating the cockerel chickens as a by-product of their egg farms, and have recommended that the cockerels should be reared to the right age and weight to make them good table poultry.

A paper read by me before the Poultry Farmers' Conference at Hawkesbury Agricultural College on 20th June, 1914, under the title "Cost of Production," showed the cost of rearing cockerels to 5½ months of age would be about 4s. 3d. per pair, including all expenses (that is, egg, fuel, food, labour, as well as interest and depreciation of plant), and that cockerels of light breeds, if well reared, should weigh 4 to 5 lb., and of heavy breeds 6 to 7 lb. at the age mentioned. The prices then obtainable for these sorts were 5s. 6d. to 7s. 6d. per pair during the plentiful season. I then went on to say :—

> I have no hesitation in giving it as my opinion that if a greater number of the class indicated was in regular supply, there would be a very great increase in the consumption of this article of diet. It is the miserable, half-grown, weedy specimens that choke up our markets, and are the real bar to a thriving business in table poultry. Another point that I wish to emphasise is, that weights above quoted, or older birds than those indicated, are less desirable, and will accordingly recede in value.
>
> It should be understood that I am not now dealing with the class known to the trade as "grillers." Undoubtedly, high prices are obtained for birds of this description at very tender ages early in the spring ; but as soon as November is reached, there are far too many birds of this class sent in, and they become a drug upon the market. This is where the line must be drawn if the best results are to be obtained. It will be observed that my figures presume the lighter breeds to be as heavy feeders as the heavy kinds. I admit that this is open to some difference of opinion, and needs an exact experiment to elucidate it. At the same time, observation leads me to the conclusion that there is very little difference in the amount of food consumed by the heavy and medium light breeds, at any rate. This opinion at first sight might appear untenable ; but it must be remembered that there is a great difference in the activity of the two kinds under review, because the heavy breeds are slow in movement and tend to put on frame and flesh, while the lighter breeds by superabundant energy use up much more food in proportion to their weight, and the difference, if any, is less than might be expected.
>
> Perhaps I assert, not as a matter of opinion but as a fact demonstrated by actual experience and practice, that, brought to the right ages and weights, under ordinary commercial conditions, and with ordinarily good plant to handle them, the cockerels will pay to rear. My advice is do not wait for reputed dear seasons, or dispose of the birds because they are in your way, but dispose of them only when they are just ready, and by doing so make a name for table poultry, as you must do for your eggs, if the highest prices are to be secured.

The above calculation as to the cost of producing cockerels was based upon an experiment carried out by me on 1,200 chickens, the number being the count at the end of the five and a half months. While the experiment was being carried out feed was at cheaper rates than when the paper was read at the 1914 Conference, but the increased cost of food at that time was added to bring the calculation up to date. Thus, it was brought to the point where pollard and bran stood at 1s. per bushel, and wheat at 4s. per bushel. The food item under this calculation would amount to 1s. 3¾d. per chicken, and other expenses would represent 9d. per chicken, half of the last figure being for labour in rearing. This made 2s. 0¾d. per bird, or 4s. 1½d. per pair. Ten per cent. of the food item was finally added to cover the difference between feeding cockerels and feeding pullets, making 4s. 3d. per pair.

The prices ruling for foodstuffs at the present time are only slightly higher than when the last computation was made, especially where food is bought in bulk, but even if we allow that it costs 4s. 6d. per pair to produce cockerels of the age and weight mentioned, they will be much more profitable than if marketed too early at a loss. The value of the food consumed in rearing cockerels will be seen to be much less than is generally imagined by the average poultry farmer. A mistake made by many poultry-keepers in attempting to compute the cost of rearing, also, is to calculate the cost of feed at the full cost of feeding adults ; this, of course, is an error.

It should be remembered, too, that included in the cost is the poultryman's labour and time, although the amount set down for that item would have to be much increased at the present time if outside labour on the basis of short hours were employed.

In regard to the prices obtained for cockerels, it should be understood that they will make more now than at the time this paper was read. The writer has returns before him showing that during last season cockerels of the age and weight mentioned above were making as follows :—Light breeds (say Leghorns), 5s. 6d. to 6s. 6d. per pair ; heavy breeds (including Orpingtons, Wyandottes, and Rhode Island Reds), 7s. 6d. to 10s. 2d. per pair, in Sydney market. It should be understood that birds will not necessarily bring these prices because they happen to be of the breeds mentioned ; that is where the misunderstanding of the position comes in. They must be the weight and young—not staggy specimens.

These calculations are based upon good rearing, because unless good development is secured table poultry is not likely to be profitable ; but the same condition affects egg-production—if not to the same extent, still very largely—and the poultry farmer who fails in this particular cannot succeed either with one or the other, or with both.

Toe-picking among Chickens.

Many inquiries have been received as to the cause of this trouble among young chickens. Common salt is a preventive, if used daily and in proper quantities. True, poultry are susceptible to salt poisoning, but this occurs when excessive quantities are used or where it is not thoroughly mixed through the food. The right quantity is 4 to 4½ oz. to each bushel of dry matter (pollard, bran, &c.) forming the morning mash, and the best way to add it is by dissolving it in the liquid with which the mash is mixed. Raw salt coming in contact with the lining membrane of the crop is calculated to cause very serious symptoms, and in many cases death.

SALE OF PURE-BRED AYRSHIRE CATTLE AT GRAFTON EXPERIMENT FARM.

THE Department has arranged with Messrs. Carlton and Carlton, Auctioneers, Brushgrove, in conjunction with Messrs. McDonald and Hines, Grafton, to conduct an auction sale of twenty-nine cows, seven heifers, and ten bulls at the Grafton Experiment Farm, on Wednesday, 25th September, at 1 o'clock. A small additional lot of steers will also be offered.

Catalogues containing full particulars of pedigrees, and other information required, can be obtained from the Under Secretary and Director, Department of Agriculture, Sydney, or from the auctioneers.

The Train service is as follows :—

Leave Sydney, Monday, 23rd September, (Brisbane Mail), 2·0 p.m.—Arrive Glen Innes 5·47 a.m. 24th September.

Leave Wallan-garra, Monday, 23rd September, 6·40 p.m.—Arrive Glen Innes 9·22 p.m.

(Service Cars leave Glen Innes daily for Grafton as follows :—7·30 a.m., arriving at 2·30 p.m.)

Murwillumbah-Grafton :—Leave Murwillumbah, Tuesday, 24th September, at 6·0 a.m. Leave Lismore at 9·35 a.m., and arrive Grafton at 4·30 p.m.

(Service Cars leave Lismore daily at 8·0 a.m., and arrive Grafton at 3·0 p.m.)

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Albury.

Mr. J. R. Moody, Assistant Fruit Expert, visited this district, and gave a number of pruning demonstrations under the auspices of the local branch of the Bureau. Peaches, prunes, and grapes came in for special attention, and growers generally appreciated the suggestions made.

Bankstown.

A pruning demonstration was given at Mr. Myhill's orchard on 6th July, by Mr. W. le G. Brereton, Assistant Fruit Expert. Quite a number of varieties of trees were operated on, keen interest being manifested by growers.

Cattai.

A meeting of this branch was held on 1st August. The principal business transacted was the settling up of accounts in connection with the branch's exhibit at the recent Hawkesbury District Show.

Clovass.

On 10th July Mr. Devlin delivered a very interesting and instructive lecture on dairying, which was appreciated by a large attendance of dairymen.

A meeting was also held on 19th July, general business being transacted.

Coraki.

The annual meeting of this branch was held on 27th July.

The Secretary's report stated that eight meetings had been held during the preceding year. The most important feature of the year's operations was the branch's exhibit at the Coraki show, an excellent collection of produce being obtained, despite the very adverse weather conditions from which the district suffered. The branch had also been much interested in a scheme to encourage boys in the pursuit of agriculture. Floods spoiled the plots, but arrangements were being made to resume the work in the coming season.

The balance-sheet disclosed a satisfactory state of affairs.

The election of officers resulted thus:—Chairman, Mr. W. J. Hodge; Vice-Chairmen, Messrs. L. H. C. Robinson, C. Blackwood; Hon. Secretary and Treasurer, Mr. G. A. Forrest; Auditor, Mr. J. Storey, jun.

Cotta Walla.

A meeting of this branch was held on 24th June, when two interesting papers were read, the first by Mr. G. W. Butt, and the second by Mr. T. J. Kennedy.

TREATMENT AND HANDLING OF FARM HORSES.

Mr. BUTT considered the Clydesdale the best class of farm horse for the district, for the soil was heavy and strong horses were necessary to work it properly. Horses should be fed three times a day—early morning, mid-day, and evening—with good, clean oaten or wheaten chaff. In dry hot weather it was a good plan to throw a little water on the chaff in the feeder to moisten it. Horses should always be watered before being fed. All working horses should be well brushed down every morning before being harnessed, particularly the shoulders, for if the shoulder is dirty when the horse begins to work, the collar is likely to cut the skin, causing sore shoulders.

In handling young horses the first thing to do was to mouth them. A strong pair of winkers should be placed on the horse, and strong reins attached to the winkers. He should then be driven about for an hour or two, and will soon become accustomed to being guided and handled. He may then be put in a team and worked lightly for the first week or two. A soft collar should be selected for the young horse at first, so as not to cut or scald his shoulders ; after a few days' work the shoulders will become solid.

DISCUSSION.—Some members preferred the lighter, more active class of draught for the farm, as they travelled better on solid and on ploughed land It was generally considered that the best method of hardening a young horse's shoulders was to wash them down with cold water during the first few days as soon as the collar was removed.

DISTEMPER IN DOGS.

Mr. KENNEDY said that during the first twelve months of life many dogs became affected with this complaint, which was responsible for many deaths, and for imperfect recoveries that left the dog affected with chorea. Distemper was a disease which manifested itself in many ways, and consequently it was difficult to lay down rules for treatment which a layman could follow.

The most common symptom was the presence of a discharge from the eyes and nostrils. This might be thin and disappear in a few days, or it might be so thick and sticky as to prevent the eyes from opening and the dog from breathing through the nostrils. Many dogs had distemper and died without showing these symptoms at all, death being put down to other causes. Sometimes the discharge was mixed with blood. Often the mucous membrane of the eye became so swollen that the eyeball could not be seen. When this occurred it required constant care and attention to prevent ulcers from forming on the eyeball. In cold and wet weather dogs frequently had also attacks of bronchitis and pneumonia, which were manifested by wheezing, rattling noises, coughing, and quickened breathing. When dogs were seen to be so affected the conditions were very dangerous.

During the early stages of distemper, especially in young dogs, there was generally an eruption of the skin of the inside of the thighs and along the belly. Sometimes this discharged a soapy, stinking matter. This skin trouble, though not always present, was nearly as common a symptom as the running at the nose and eyes. When a pup was seen to vomit, especially if he had a persistent diarrhœa, distemper might be suspected. This diarrhœa often persisted for weeks, and no remedy appeared to have any effect upon it. One of the commonest signs of distemper was the presence of a brownish, slimy discharge, which hung in long strings from the lips, and often had an offensive smell. If the mouth was opened and the gums examined they would be found to be much inflamed, and often spongy and ulcerated. Lastly, convulsions often occurred in young animals, and this was the most fatal symptom of all

Distemper was a disease which always ran its course, and all that could be done was to assist nature as much as possible. Directly a pup showed signs of distemper, he should be taken in hand and separated from the others. If he was dull, would not eat, and wasted away without apparent cause, it was most probable that he had the disease. He should be kept warm in a dry place, and if the weather was very cold or damp, a piece of blanket should be tied over the chest and loins. Food should not be forced on him at first, but small quantities of milk, mixed with bread and boiled with rice, might be given three or four times a day. If diarrhœa was present, meat or biscuits should be given sparingly, but otherwise, as in the snuffling form of the complaint, they might be given. If the dog had been sick a long time, was very weak, and would not eat, then force a few tablespoons of milk or a little beef tea or white of an egg into him. A teaspoonful of brandy added to the milk or egg was good. Small quantities of finely-chopped raw meat were good when the pup was getting better. When there was a discharge from the eyes and nose, it was a good plan in the early stages to give a teaspoonful or two of strong brine. This caused the dog to vomit, and cleared the air passages. In this form twenty drops of sweet spirits of nitre in water three times a day gave good results. The eyes, nose, and mouth should be washed with warm water twice daily to remove the discharge. Should the lungs be affected, mustard and water should be rubbed on the ribs. If the eyes got very bad they should be bathed with warm water to which boracic acid had been added, in the proportion of a teaspoonful to the pint. The kennel should be kept very clean. Constant care and attention was the secret of success, and a cure was therefore perhaps not worth attempting in most cases.

Cunningham.

A meeting of this branch was held on 26th July, when final arrangements were made for a visit and lecture by Mr. H. C. Stening, Inspector of Agriculture, during August.

It was decided to communicate with the Principal Librarian, Sydney, for the loan of books for the use of members of the branch.

Kellyville.

A meeting was held on 6th July, when a discussion took place on woolly aphis and how to control the pest.

Members also met on 3rd August, when the subject of the protection of native birds was discussed at some length.

Lidcombe.

A well attended meeting of the above branch was held on 1st July, when a lecture was given by Mr. Finch on the method of allotting points by judges at shows.

At a later meeting on 29th July an interesting lecture on the hatching and rearing of chickens was delivered by Mr. J. Hadlington, Poultry Expert.

Matcham.

A meeting of this branch was held on 20th July, when an interesting paper, entitled "Sprays for the Orchard," was read by Mr. A. E. Caldwell. At the conclusion of the paper a profitable discussion took place on spraying.

Middle Dural.

The annual meeting of this branch was held on 21st June, when the business included the election of officers and adoption of the balance-sheet. A paper was also read on the cool storage of fruit.

Nimbin.

A meeting of the above branch was held on 27th July, when discussions took place on feeding pigs with pea-meal and molasses, and also on blackleg in cattle.

Parkesbourne.

At the annual meeting of this branch the following office-bearers were elected for the ensuing year:—Chairman, Mr W. H. Weatherstone; Vice-Chairmen, Messrs. G. Brown, H. Bastin, and C. Apps; Treasurer, Mr. J. Brown; Hon. Secretary, Mr. S. W. McAlister.

The annual report disclosed a very successful year's work. It was decided to again forego the annual subsidy, as members considered there were sufficiently heavy drains on the public funds.

As a result of the efforts of the branch, a gathering organised in aid of the local Soldiers' Comforts Fund raised £24.

A pruning demonstration, conducted by Mr. J. R. Moody (Assistant Fruit Expert), was given at Mr. G. Brown's orchard on 5th August. There was a large gathering of fruitgrowers and others, some visitors coming 10 and 12 miles.

PRUNING DEMONSTRATION.

The work was carried out in a very interesting. way. The up-to-date methods, with their intelligent application, met with the approval of the audience, most of whom were growers of long experience.

The first tree operated on was a Goldmine nectarine, pruned by a Departmental expert twelve months ago. This variety can stand pretty severe cutting, as it naturally produces a good crop of fruit buds.

Several kinds of peaches were handled. With the McDevitt, a system new to this locality was demonstrated ; owing to the entire absence of fruit buds the operator cut off all laterals, leaving the limbs bare as whipsticks, but with the tops uncut. The idea is to produce an entirely new lot of fruit twigs.

Other trees operated on were apples, including Claygate, Five Crown, Jonathan. Granny Smith, Gravenstein, and Rome Beauty. Mr. Moody advocated summer pruning of the laterals of Rome Beauty, no pruning of the laterals of Jonathans until the fruit buds are formed, but insisted on the heading of the Jonathan leaders every season. Laterals were not essential to Five Crown, as they produced sufficient fruit buds, which occasionally required trimming as the tree aged.

With regard to woolly aphis, all apples should be sprayed every year, whether the aphis was showing or not. Growers would then have less trouble with the disease. It was bad policy to wait for woolly aphis to show before applying the spray.

For leaf curl, according to Mr. Moody, one lime-sulphur spraying (in July) would probably be found sufficient.

If a grower got his young cherry trees shaped properly in three or four years, say with ten or twelve leaders, they should not be topped afterwards. It would cause them to gum. To check the borer grub, squirt petrol from a small oilcan into the hole and plug with wax. Kerosene was also efficacious, but apt to injure the surface of the tree on which it flowed. Should any petrol be dropped on the tree, it evaporated, and so had no injurious effect.

The expert and the visitors were subsequently entertained at afternoon tea at Mr. G. Brown's residence, and a vote of thanks was tendered Mr. Moody for his very instructive afternoon's work.

The Secretary of this branch reports that five junior members attended the Winter School at Hawkesbury Agricultural College, and gave accounts of their experiences at a recent meeting, reading papers on subjects in which they had been specially interested.

Pinus insignis FOR CASE TIMBER.

In conversation, Mr. Moody referred to the value of pine plantations for case-making. Speaking of the efforts to meet the scarcity of case timber in other States, he said the pines were planted 8 feet apart, and were then thinned out, when large enough for poles, leaving the remainder to attain the greater size for milling purposes. He had seen a fair quantity of cases cut from eight-year-old trees. In this connection the Government of West Australia was considering the planting of 500 acres of pines per year in State forests on waste coastal lands. The green timber was cut only with a coarse saw. When nailed together the nails would not draw out easily, a great advantage in handling and shipping. Wharf labourers and railway loaders found the rough cases quicker to handle; the smooth cases were more apt to slip.

Rawsonville.

The monthly meeting of this branch was held on 19th June, Mr. F. Sunderland presiding.

Mr. O. P. Chater gave an impromptu address on poultry-keeping for the district.

POULTRY-KEEPING FOR PROFIT.

If it was intended to keep poultry for eggs, White or Brown Leghorns were the most suitable breeds, but for dual purposes either Rhode Island Red or Black Orpington standard strains should be procured in order that a good foundation should be laid. The pens should be constructed on the semi-intensive principle, and straw or chaff should be scattered on the floor, and the wheat thrown on this to provide the birds with exercise. The straw should be changed once a month Water should be placed where the sun would not shine on it, and a box of grit should be put in each pen. The roosts should be hung on wires, not more than 2 feet from the ground, and bottles full of crude kerosene could be placed on the wires to keep ticks back. The roost should be painted regularly with kerosene.

The feeding was important. Two kinds of mash could be used—dry and wet, but the latter was preferable. For seventy hens an armful of lucerne could be cut up fine and steamed, and mixed with pollard and bran, and a rabbit that had been boiled and then put through the mill (bones and flesh). A handful of wheat for each hen at midday, and about a handful of mash again in the evening, made a useful ration. The ration should not be changed while the hens were laying. The mash should have salt added to it regularly, and once a week an ounce of Epsom salts could be put in each gallon of drinking water.

In selecting eggs for hatching, smooth, round eggs were best, and they should not be kept longer than a week, and should be turned daily. When the incubator chicks hatched out they should be given nothing for forty-eight hours, and then rolled oats could be thrown to them. Cracked wheat and shell grit should not be introduced till after the ninth day, and at the end of three weeks the chicks could be put on wheat. Some people advocated that hard-boiled eggs should be given, but that was a mistake. The best time for hatching heavy breeds was July and August, and for light breeds August and September.

DEPARTMENTAL NOTE.—The Poultry Expert remarks that the idea that suspended perches will prevent tick infestation is not altogether sound. Nothing but getting rid of the tick will be effective.

Spencer.

At a meeting on 15th June Mr. E. C. Allen read a paper, from which we take the following:—

TOMATO GROWING.

There are two things essential to tomato growing for profit—good reliable plants true to name and good cultivation, but good cultivation is lost if in the first place the plants are worthless.

There are many different methods of planting tomatoes. That which I prefer is the furrow system. After thoroughly preparing the ground, take the plough and open up furrows 4 inches deep and 6 feet apart; then lightly dust them with whatever manure is to be used—blood and bone for preference. The planting can then be made straight across the drills, at a distance of from 4 to 5 feet. This enables cross cultivation, which should be given at least every second week, and once a week if time permits. Give the first cultivation after the plants have had time to set, which will be in nine or ten days. This will fill in the furrows made for planting and also cover the fertiliser. Care should be taken in this operation not to disturb the plants.

When the plants were beginning to show the first blooms, they should receive another dressing of manure, this time between the rows, and then a cultivation.

In harvesting, some growers prefer letting the tomatoes ripen on the vine. For my own part, I think pulling them when they have reached a fair marketable size and are beginning to show a whitish tinge, and packing them away to ripen, which will take from four to five days, is the best method. It gives the tomatoes that are left a better chance of gaining size.

The variety to grow depends on whether the crop is to be early, mid-season, or late. For an early crop, Earliana or Chalk's Early Jewel are two of the best grown. Earliana is a shade the earlier if anything, and has the habit of bearing its fruit in clusters and ripening evenly, but being very thin skinned it is liable to crack with rain after a dry spell. Chalk's Early Jewel, though hardly as early, is a good cropper, and ripens in clusters but free from split, and therefore in my estimation is worthy of pride of place. For mid-season Burwood Prize is hard to beat, being a good grower with a dense foliage which protects the fruit a lot during the heat of the day, and fairly free from blight. Matchless is a tomato that stands alone for the late crop, a vigorous grower, bearing until the frost cuts it back, and giving good average tomatoes right through the season. It can also be pulled on the green side, packed in boxes, and opened up in the market in good order.

A meeting was also held on 13th July, when an interesting discussion took place on Brown Spot in mandarins, and also on fruit fly baits.

Springside.

A meeting of this branch was held on 23rd July, and an interesting paper was read by Mr. John Selwood on seeds and plants, a *résumé* of which follows. Three papers were also read by lads who have just left school, and were appreciated by the older members of the branch.

Advantage is being taken for the loan of books from the Public Library, and a box has already been sent for.

It was decided to purchase various kinds of vegetable seeds to be grown by the members for exhibition at the Orange show.

Germination and Radication of Seeds and Plants.

Mr. Selwood said that to obtain a clear view of the theory and practice of agriculture it was necessary to keep in mind that plants contain combustible and incombustible material, the former being derived chiefly from carbonic acid, ammonia, sulphuric acid, and water, and the latter chiefly from phosphoric acid, sulphuric acid, soda, lime, potash, magnesia, &c. The vital processes of plant life build up the body of the plant from these materials, under favourable conditions—heat and sunlight. The development of a plant depends upon its first rooting, and the choice of good seed was therefore of the greatest importance to the future plant. A crop of wheat will exhibit differences in the size of the grains, some being larger, others smaller than the average, the cause being that the stalks do not all shoot into ear and flower at the same time, hence the seeds are far better developed in one than in the other, and if sown they will produce a crop of plants as unequal in their development. It is necessary, therefore, to grade the seed thoroughly. In fact, farmers are acting against their own interests in not doing so, and are negativing all the pains and expense they may take in preparing the seed-bed.

Mr. Selwood proceeded to point out that the habit of different plants determined the kinds of seed-bed that should be prepared for them. Farmers should decide in good time what crops they intended to plant, and having decided they should cultivate their land accordingly.

Tennyson (North Richmond).

A meeting of the above branch was held on the 1st June, when general business was transacted.

Thyra-Bunaloo.

A meeting was held on 22nd June, when Mr. R. Adams read a paper that provoked an interesting discussion.

A Farmer's Garden in this District.

The vegetable garden, providing there is some spare time and water is available, is a source of pleasure and of profit. It does not require a big plot to grow enough vegetables for a farmer's own use.

To prepare a plot it should be well dug up and subsoiled The soil should be loamy, if possible; and if weeds are kept down and water is used when required, all vegetables suitable to the district can be grown. The soil should not be allowed to set after watering, as subsequent waterings will not then benefit the soil as they should.

About July or August a plot should be prepared for tomatoes. My experience is that the Early Pride variety is the best. The seed should be set in a box with a glass covering, and when the plants are large enough, they should be transplanted and set out in rows, the rows being about 2 feet apart. The rows should be hoed up and watered in drains, but the water should not touch the plants. I have grown tomatoes without a failure, and the plants have been loaded with large smooth-skinned tomatoes, which ripen first about Christmas and continue to ripen till May. One reason for the success was that I pruned and watered the plants when required. The plants should be tied to stakes and all side shoots taken off for about a foot high from the ground, leaving about three branches. When the flowers set, nip off the leaders for early bearing.

Every farmer can have a fruit garden whether he has a supply of water or not. I have a small garden, and the return every year more than compensates me for the trouble and work. Peaches, apricots, apples, and oranges can be grown best in this district. The trees should be pruned regularly, and sprayed to kill insects, &c. Choose a piece of loamy or sandy soil, plough well, and subsoil if possible; where the clay is close to the surface, work the soil fairly deep. When planting the trees do not dig a very deep hole; place the trees 20 feet apart. They will probably require some water to start them. Keep the soil well worked and kill all weeds. Harrow after every rain in the spring and summer.

A meeting of the branch also took place on 20th July, when a paper was read by Mr. N. Scott, from which is taken the following:—

Disc Implements against Other Implements.

Under some conditions I find a disc implement to be as good as any other. If a disc plough and a set plough are used for fallowing similar land under certain conditions, equal crops will result. However, there are times when the ground is very hard, and a disc plough can be used when a set plough cannot. On the other hand, in very soft ground a set plough can be used when the disc implement would almost go out of sight. In such ground the set plough is much better and does much nicer and finer work, and the ground takes less breaking down when it sets. In badly-grubbed land, or when straw has been left, the disc plough should be the better of the two types, as the roots will not affect the discs much and the straw will go through without much bother. But for most work I would sooner use the set plough, because it is better to handle than the other, and it does the better work in this district.

For working up fallowed land I think there is no better implement than the disc cultivator for all kinds of ground. It will do a good job in very hard fallow, where no other implement will work unless the teeth or tines are dressed very often. The scarifier spring tooth cultivator does good work in light ground where there is no weed-growth or rubbish. For dirty fallow the disc cultivator will kill more weeds than other machines, and it is also lighter to pull than other machines of the same width.

Tingha.

The monthly meeting of this branch was held on 6th July, when it was decided to co-operate with the Inverell branch in staging an exhibit at the next Inverell show. After the general business had been disposed of, the meeting adjourned to Mr. Lockrey's poultry yard for an inspection of the poultry.

The balance sheet of the last exhibition held by this branch showed that after donating £10 to patriotic and charitable purposes, a balance of £10 3s. 3d. was left as a nucleus for next year's effort. Donations amounted to £20 5s. 6d., the sale of tickets of admission, &c., to £28 4s. 9d., entry money to £13; the receipts, supplemented by smaller items, totalled £67 10s. 3d. The expenditure included prize money £23 14s., rent £3, luncheon £4 6s. 6d., printing and advertising £6 15s., and smaller items.

Toronto.

A meeting of this branch was held on 2nd July, when an interesting paper was read by Mr. Cockburn on the pruning and spraying of grape vines.

It was decided that the senior boys attending the local school be invited to attend special lectures given in connection with the branch.

Valla.

A meeting of this branch was held on 1st July, when it was reported that Mr. E. F. Duffy, Fruit Instructor, Department of Agriculture, had given a pruning demonstration on 26th June at Mr. J. R. G. England's orchard. Mr. Duffy also gave advice generally on the treatment of diseases that were showing on the trees. The demonstration was of immense value to beginners in fruit-growing Particular stress was laid on the importance of entirely eradicating the San José scale, which disease was in evidence on some of the trees.

The Most Profitable Pig.

At the same meeting a discussion took place on the most profitable pig for the district. One member held the view that the Tamworth cross grew into the best pig, both as a porker and as a baconer. Another favoured the progeny of the Berkshire boar and the Tamworth sow. Several others favoured the Berkshire-Tamworth-Berkshire as a money-maker, contending that this was an ideal bacon pig. Separated milk was considered good food for pigs, topped off with maize. The opinion expressed was that they should be fed frequently—three or four times a day if possible—and it was important to keep the pigs growing, as the breeding was found to be in the trough. It was regarded as advantageous to have the food cooked, as too much green food given in the raw state was apt to cause worms. Some of the members grew maize, and after the last hilling they planted cowpeas between the rows. When the latter were ripening they turned in the pigs ; they would not touch the maize until the cowpeas were all eaten up. Several farmers fed cow cane in the ration.

One member reported having had bad luck with pigs ; they grew nicely to a fair size, and then seemed to develop staggers, getting weak in the back legs and spine.

Departmental Note.—The Chief Inspector of Stock states that the condition referred to in the concluding paragraph is no doubt of dietetic origin, and it is difficult to say what element of the fodder is at fault in the absence of an inquiry on the spot as to the fodder used and methods of feeding.

Wellington.

A largely attended meeting of the branch was held on 14th June, when the Secretary, Mr. L. Jurd, read a paper on poultry-breeding, which was much appreciated by all present, and which provoked a very interesting and useful discussion.

The monthly meeting was held on 12th July, when a useful evening was spent discussing various pruning problems, in connection with which suggestions were given by Mr. L. Jurd and Mr. H. Hilton. A conversational discussion also took place on grape-growing, seedling trees, fruit-fly, figs, the destruction of fallen fruit, &c., a profitable time being spent.

On 16th July, Mr. W. le Gay Brereton, Assistant Fruit Expert, visited the district, and conducted pruning demonstrations in the orchards of Mr. J. Edwards and Mr. M. McLeod. Valuable suggestions were made, especially in connection with stone fruit, and much interest was taken in the work.

Windsor.

The members met on 2nd August, when it was decided to stage an exhibit at the Hawkesbury District Show, and arrangements were made for the purpose.

A lecture was delivered by Mr. W. H. Spinks, of which a report follows:—

WOOLLY APHIS.

In this district, as well as in other fruit districts, the best varieties of apples are seriously damaged by woolly aphis, sometimes called American blight; the scientific name is *Schizoneura lanigera*. So great, in fact, is the damage wrought by this pest, that growers are always on the look-out for varieties that are immune to its attacks. Among the best kinds of apples for commercial purposes that are very susceptible to damage by aphis are Jonathan, Granny Smith, Trivett, King David, Mobb's Royal, Cleopatra, Delicious, and Andrew Stephens. Those varieties that are very slightly affected or immune are Lord Nelson, Carrington, Gravenstein, Stone Pippin, Fameuse, and London Pippin. It will at once be seen that the very best kinds are subject to the ravages of this pest, and in order to grow apples profitably only the best kinds should be grown, providing such kinds crop well in the locality. However, it is the matter of treating trees already established in the orchard that mostly concerns the grower; and seeing that there is not a large assortment of blight-resisting varieties to choose from, it is almost certain that the best kinds will continue to be planted without any regard to their immunity or susceptibility to woolly aphis attack.

There are several kinds of resistant stocks on which the apple can be worked, among them being Northern Spy and Winter Majetin. I would recommend either of these, but for preference the former, because it is hardy and thrifty, produces the largest trees, and is absolutely immune. A characteristic of the Northern Spy is the presence of lumps like carbuncles about the stock and butt, and even on the large branches. The inexperienced often think these have been caused by woolly aphis, but they are of no consequence. Woolly aphis itself may at times be found about these excrescences, but the aphides will disappear when the tree is cleansed above the union.

Woolly aphis attacks the apple tree both above and beneath the surface, but by only using resistant stocks the matter of treating beneath the surface is dispensed with, even on the most susceptible scion. The presence of aphis may easily be detected by the appearance of a white, woolly-like matter about the tree. This is the outside protection of the aphides, which are of a brownish colour, and which are produced alive during the warm months, from two to fifteen being produced by a single female in a day. In three weeks the young commence to reproduce, so that it takes but a short while to produce myriads of aphides. Towards the close of the warm months a winged form of aphis appears, and this spreads the infestation by flying from tree to tree until the whole of the trees susceptible to attack in the orchard become infected. From these winged aphides, which are females, there arises a brood consisting of males and females which are wingless, and the females of this brood each lay a single egg, called the winter egg. This egg is deposited about the tree in a suitable spot, preferably the butt of the tree. These eggs generally hatch out in the late winter or early spring, and give rise to the females that spread about the trees, as already described. Sometimes, in the case of a very mild winter or in warm districts, a few wingless females may hibernate in well-sheltered crevices or "carbuncles," and become active early in the season.

The effect that the woolly aphis has on the tree is to cause unsightly excrescences, which are caused by the aphides piercing the bark tissue and sucking the sap of the tree. When the bark tissue is broken the tree directs a greater amount of sap to the injured part, and this causes the carbuncle to appear and to increase in size as the aphides suck the sap. If the pest is taken in time, that is, as soon as it appears, the excrescences will not develop. Once, however, the infection has become so bad as to cause a large carbuncle, the pest will be found hard to eradicate or even check. The damaging of a tree by the breaking of the bark, and even by pruning, is an inducement to woolly aphis; in summer they will attack the young growth of the tree and cause great damage. On trees that have been worked with blight-resistant kinds on blight infested stocks, the roots are continually ravaged, and at times become swollen to three or four times their natural size in places. These nodules cannot easily be destroyed by a spray. Of course, grafting on to a blight-proof stock does not render the graft immune to attack. The woolly aphis is most tenacious and difficult to eradicate owing to the difficulty in getting the spray into contact with it, and because a single female aphis is able to reproduce and thus found a new colony. It has often been contended that it has attacked resistant stock, but on close examination this has been found to be incorrect, but it is advisable to graft on to a fair shank above the ground, say about 8 inches.

The treatment for this pest is, in my opinion, best carried out as soon as it appears and it should be persevered with. In the summer months, tobacco and soft soap wash or Sunlight soap wash should be applied, warm. For winter spray, red oil is the best. Care should be taken that the oil has been properly broken down and that no free oil is on the surface. If free oil is seen floating on the surface, the emulsion is imperfect and injury is likely to be done. Many growers have seriously damaged their trees by spraying with half emulsified material. The spraying should be commenced at the top of the tree and worked downwards. A nozzle should be used with a side delivery jet, so that the attack can be made from every point of vantage. In spraying with tobacco and other non-injurious ingredients the spray can be applied through a coarse nozzle; but in using oils the nozzle should be the one that will permit of a fine spray being ejected. This is very important. Oil sprays should not drench the trees, but particular attention should be given to crevices and excrescences and other parts of the tree that will afford shelter for the pest. Get close to the tree with the nozzle and put on plenty of pressure. Unless a high pressure spray is used, the operation will not be a success. The cottony-woolly substance must be removed, so that the bodies of the aphides will be covered with a thin film of oil, which will clog the pores and set up internal irritation and kill the insects. Poor results have often been caused by improper methods. After the spraying has been done and all the spray absorbed, remove the surface soil about the trunk, so that any oil that may have got there will not be allowed to remain and cause damage to the bark tissue at the collar. In a few days the result of the spraying will be easily detected. It is not always possible, even with the best methods, to stamp out woolly aphis in one spraying, but care should be taken to promptly combat any aphis appearing after the result of the spraying has been seen. Any parts thus affected should be treated by dabbing on strong oil emulsion with a brush.

Mr. J. W. MITCHELL asked whether oils should be used where trees are growing near roads and are continually covered in dust. Mr. Spinks replied that the oil spray in such cases would have a clogging effect on the trees, and those nearest dusty roads might be treated with resin and soda.

Woonona.

A well attended meeting was held on 9th July, when addresses were given by Mr. T. Robson on the Black Orpington, and by Mr. S. P. Gahan on bee culture. Five new members were admitted to the branch, which now has a total of over 100 members.

Yarramalong.

A meeting was held on 7th August, when it was decided that members do their utmost toward the destruction of the flying fox. The common fox was also mentioned, and his destruction as strongly urged.

An endeavour is being made by this branch to obtain an improvement in the postal facilities for the district.

Some little time ago a party from this branch visited Hawkesbury Agricultural College. Members appreciated the lecture given by Principal H. W. Potts on dairying, and were impressed by the fine results obtained at that institution.

Yurrunga.

A meeting of this branch was held on 20th July, when a discussion took place on the potato crop of the district. The previous season's crop had been a failure. Several varieties of potatoes were exhibited at the meeting, amongst which were Up-to-Date (both early and late), Mowatt's Prolific, Queen of the Valley, and Satisfaction.

Orchard Notes.

SEPTEMBER.

W. J. ALLEN.

THIS is a very busy month in the orchard, for all the early spring work of ploughing, hoeing, spraying, &c., should be well in hand.

All spray pumps, carts, vats, hoses, &c., should be in thorough order, and all spray chemicals and materials should be on hand for immediate use, because the next three months is a very busy and trying time for the orchardist. Only by constant attention and promptness may disease be kept away, and the grower saved from partial or total loss of his fruit crop.

Every labour-saving device for quick mixing and application of sprays should be provided, together with an adequate supply of suitable water. The grower who leaves everything to the last moment and then finds he requires new hoses and new parts for his pumps, and that his chemicals are not to hand, or have not been ordered, generally pays dearly for his carelessness or slackness.

Stone Fruits.

Peach aphis generally makes its appearance this month, and affected trees must be sprayed—a concentrated nicotine extract being most suitable.

Stone fruits will be reaching the "pinking stage," *i.e.*, just before the blossom bursts, and all those trees which have not already been sprayed for Peach Leaf Curl, Shot Hole, Brown Rot, and other fungoid diseases must be treated immediately, with either the Bordeaux, 6—4—50 formula, or with lime-sulphur, Departmental formula used at 1 in 28. Trees which suffered severely last season from these diseases, even though they received a mid-winter treatment, should, if possible, receive a second spraying at the "pinking stage."

Apples and Pears.

Towards the end of this month the pears, and some of the earlier blossoming apples, will be reaching the "pinking stage" when the first spraying for Black Spot must be applied, quickly followed by the second spraying as the petals fall. Either lime-sulphur or Bordeaux mixture should be used. Good results have been obtained by using either of these sprays at the stage when the buds are first opening, but before the "pinking stage" is actually reached. When using lime-sulphur, it is recommended that the Departmental formula should be followed, viz., 1 in 28 at the "pinking stage," and 1 in 34 at the later sprayings. The Bordeaux mixture should be at the 6—4—50 strength at the "pinking" and at later stages.

The first spraying for Codlin Moth and also for Mildew must be given about the same time as the second application for Black Spot. Sulphide of iron for Mildew can be applied, either immediately before or after the applications of lime-sulphur or Bordeaux or arsenate of lead; it is not affected by nor does it affect other sprays, but arrangements are being made to test how far it can be combined with these other sprays in order that time and labour may be saved. Arsenate of lead, as has been pointed out before, can be mixed with Bordeaux mixture and with sulphide of iron, but reports to hand from growers state that serious burning takes place when lime-sulphur is combined with arsenate of lead. The sulphide of iron can also be safely mixed with either tobacco solution or arsenate of lead.

Full particulars of the tests carried out with sulphide of iron for mildew, and of the preparation and application of this fungicide, were given in the July number of this *Gazette.*

Pruning.

In the districts where growers, owing to shortage of labour, have not been able to complete the pruning of apples and pears, the knife may still be used without any injury, but every effort should be made to complete the work as soon as possible.

Planting

It is late for planting out apples and pears, and those who have delayed such work should complete it at once. More especially does this apply to pears, the buds on which are commencing to swell, and are therefore easily injured, while the roots have already started into growth, and should not be exposed to the air too long. Only a few trees should be lifted at a time, and they should be carried in a wet bag during planting.

San José Scale and Woolly Aphis.

Owing to the wet weather some difficulty may have been experienced in spraying for San José Scale and Woolly Aphis, and every effort should be put forth to treat these diseases, because far better results can be obtained by spraying while the trees are dormant and stronger sprays may be used. It is most difficult to spray thoroughly after the foliage appears.

Owing to Black Spot and Mildew being so prevalent last season, the use of miscible oils in the affected areas is not recommended so late in the season, because of the difficulty of getting the lime-sulphur, Bordeaux mixture, or sulphide of iron sprays to spread evenly over the oily surfaces left by oil sprays. Better results will be obtained by using concentrated nicotine sprays for Woolly Aphis, while lime-sulphur is not only effective for San José Scale, but is suitable for Red Mites, Black Spot, and other fungoid diseases. The tobacco wash may be added to the lime-sulphur to make a combined spray for aphis and San José.

Citrus Orchards.

The pruning of citrus trees may receive attention during this month, care being taken to remove all dead wood and useless water shoots, and to keep the trees sufficiently open to admit light and the free circulation of air.

The harvesting of citrus fruits still continues. Windfalls must be picked up regularly, and not allowed to remain on the ground as a harbour for fruit-fly.

Trees may be planted during the month, and if this work is not delayed, they will be well established before the hot weather sets in.

As good rains have fallen in most of the citrus districts, it will not be necessary to irrigate in those districts this month.

Manuring.

Those orchards which have not already been manured should receive immediate attention, so that the fertiliser may be turned under with the spring ploughing. If this is done, the trees will receive immediate benefit, because the fertiliser is then placed where it is readily available to the root systems.

Ploughing and Cultivating.

The ploughing and turning under of green cover crops should not be delayed. All orchards should be ploughed as early as possible so as to permit vegetable matter to rot down into humus, and to retain all the moisture possible in the soil. The discs should be run over the soil so as to make it compact, and from this on the cultivator should be kept going freely—more especially should the season be dry—so as to retain moisture during the summer months for plant growth.

Grafting and Budding.

Towards the end of the month and beginning of October the apple and pear trees will be sufficiently forward to permit satisfactory grafting, and those trees which it is intended to rework to better or more suitable varieties should be cut back and grafted. It is best, when grafting older trees, to leave one limb to take a portion of the sap. The scions for grafting should be heeled into the soil until required.

It is preferable to head stone fruit trees hard back, and to bud the new growth about December, or earlier if it is forward enough.

Peach Tip Moth.

This pest was so bad last year, especially in the Cumberland district, that we must expect it to be very destructive during the coming season, and a closer watch must be kept for its first appearance. It is recommended to pinch off and burn the affected tips of the shoots. Infestation is indicated by the tips drooping after they have been penetrated by the maggot. By careful treatment in this manner the bulk of the first brood may be destroyed, and the chances of the fruit being badly affected by the later broods will be considerably lessened.

Vines.

Black Spot and Oïdium (Mildew) were very severe last season. For the former the vines should be swabbed as soon as the buds begin to swell, using a swab composed of 35 lb. of sulphate of iron, 7 lb. of sulphuric acid, and 10 gallons of water, followed by an application of Bordeaux mixture 6—4—40, when the buds burst, again just before the flowers open, and yet again after the fruit sets.

Dust the vines with fine sulphur when the shoots are 6 inches long, and repeat this treatment weekly until danger from Oïdium is passed.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
Ganmain A. and P. Association	T. S. Henderson	Sept. 10, 11
Young P. and A. Association	T. A. Tester	,, 10, 11, 12
Cowra P., A., and H. Association	E. W. Warren	,, 17, 18
Culcairn P., A., H., and I. Society	J. B. Ryan	,, 17, 18
Narrandera P. and A. Association	J. Faulkner	,, 17, 18
Temora P., A., H., and I. Association	A. D. Ness	,, 17, 18, 19
Burrowa P., A., and H. Association	W. Burns	,, 19, 20
Holbrook P., A , and H. Society	J. S. Stewart	,, 19, 20
Queanbeyan P., A., H., and I. Association (Annual Horse Parade and Sheep Dog Trials.)	J. G. Harris	,, 21
Canowindra P., A., and H. Association	H M. Brown	,, 24, 25
Henty P. and A. Society	H. L. Yates	,, 24, 25
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25
Wyalong District P., A., H., and I. Association	T. A. Smith	,, 24, 25
Yass P. and A. Association	E. A. Hickey	,, 26, 27
Junee P., A., and I. Association	T. C. Humphreys	Oct. 1, 2
Narromine A. H. and P. Society	C. E. Skinner	,, 1, 2
Ardlethan and District P. and A. Society	W. J. Nixon	,, 2
Deniliquin P. and A. Society	P. Fagan	,, 2
Eugowra P., A., and H. Association	R. A. Douglas	,, 2
Hay P. and A. Association	G. S. Camden	,, 9, 10
Millthorpe A. and H. Association	C. J. E. Hawken	,, 23
Tweed River A. Society (Murwillumbah)	T. M. Kennedy	Nov. 13, 14
Lismore A. and P. Society	H. Pritchard	,, 20, 21

1919.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	H. G. Fraser	Jan. 15, 16
Kiama Agricultural Society	G. A. Somerville	,, 25, 27
Dapto A. and H. Society	F. James	,, 31; Feb. 1
Shoalhaven A. and H. Association (Nowra)	H. Rauch	Feb. 13, 14
Manning River A. and H Association	L. Plummer	,, 19 20
Ulladulla A. and H Association (Milton)	R. F. Cork	,, 19, 20
Yanco Irrigation Area A. Society (Leeton)	T. H. Hogan	,, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 25, 26, 27
Inverell P. and A. Association	J. T. Dale	,, 25, 26, 27
Newcastle A., H., and I. Association	E. J. Dann	,, 26, 27, 28; March 1
Tenterfield P , A., and M. Society	R. S. Smith	Mar. 4, 5, 6
Tumut A. and P. Association	T. E. Wilkinson	,, 5, 6
Cootamundra A., P., H., and I. Association	N. Gardner	,, 11, 12
P. and A. Assn. of Central New England (Glen Innes)	G A. Priest	,, 11, 12, 13
Goulburn A., P., and H. Society	H. C. Fraser	,, 13, 14, 15
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 14, 15
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 18, 19, 20
Armidale and New England P., A., and H. Assocn.	A. McArthur	,, 18, 19, 20, 21
Cobargo A., P., and H. Society	T. F. Kennelly	,, 19, 20
Crookwell A., P., and H. Society	P. R. Marks	,, 19, 20
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 19, 20, 21
Hunter River A. and P. Association	E. H. Fountain	,, 26, 27, 28, 29
Camden A., H., and I. Society	A. E. Baldock	April 2, 3, 4
Dungog A. and H. Association	W. H. Green	,, 2, 3, 4
Quirindi District P., A., and H. Association	A. Pountney	,, 2, 3, 4
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 9, 10
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 15–23
Moree P. and A. Society	A. U. Ezzy	May 21, 22, 23

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THE

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1918.

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DEPARTMENT OF AGRICULTURE, NEW SOUTH WALES.

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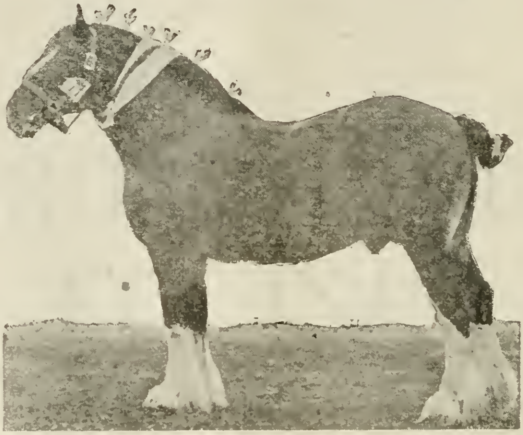

CLANDALE (14628), C.S.B.

Sire, Allandale (12418), C.S.B., by Sir Hugo.
1st Dam, May Logan (21199), C.S.B., by Prince Robert (7135), C.S.B.
2nd Dam, Haidee (21198), C.S.B., by Prince of Wales (673), C.S.B.
3rd Dam, Jess of Portlogan (3145), C.S.B., by Lofty (460), C.S.B.
4th Dam, Kate, by Hercules (378), C.S.B.

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1st Dam, Gem of Craigwillie (21597), C.S.B., by Prince of Thomas (16262), C.S.B.
2nd Dam, Lady Edith of Craigwillie (15687), C.S.B., by Prince Currachan (8151), C.S.B.
3rd Dam, Jean of Northfield (18564), C.S.B., by Star of the North (2435), C.S.B.
4th Dam, Cowden Jean (19435), C.S.B., by Clydesdale Jock (1415), C.S.B.

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2nd October, 1918.

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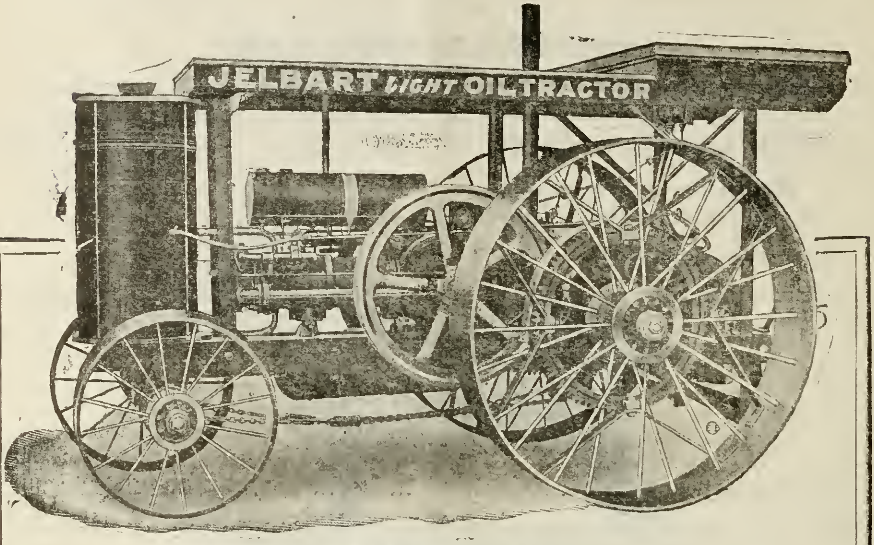

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The Grain Sorghums.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

ALL sorghums were at first supposed to be derived from a wild species of grass, viz., *Andropogon halepensis,* of which Johnson grass is a typical representative. The underground creeping rootstocks of Johnson grass, however, and its perennial character, make it extremely difficult to reconcile it with our annual sorghums. Sudan grass, which is really half a grass and half a sorghum, appears more closely related to the sorghums; and it seems more feasible to believe that the sorghums have been derived from a wild species of grass, such as Sudan grass, than from such a plant as Johnson grass.

Sorghums have been known and cultivated almost from time immemorial, and Egyptian records of this class of fodder plants have been discovered, dating as far back as 2500 B.C. At the present time sorghums are grown for one of three purposes—for forage, for grain, or for brush. In early times, however, it was the grain sorghums which were mostly grown. This was probably due to the fact that the seed was one of the chief sources of diet of mankind, just as it is at present among many of the native tribes of Africa. As civilization progressed and social conditions changed, the use of the grain as an article of man's diet diminished, and for a considerable period the cultivation of the grain sorghums was not encouraged. Especially was this so because the stems were not considered the best form of animal forage, owing to their pithy contents, and much better results could be obtained from the saccharine sorghums. Of late years, however, certain characteristics have been discovered amongst the grain sorghums which are highly important in the economy of farming, particularly in dry areas. These are—(1) their ability to set grain, sometimes in large quantities, under very adverse conditions; (2) the nutritive quality of the grain; and (3) the remarkable drought-resisting properties of the plants.

There are four varieties of grain sorghums of economic importance, viz., Kafir, Milo, Feterita, and Kaoliang.

The History of Several Varieties.

The Kafir grain sorghums were at first thought to be native only to the extreme southern portions of Africa, but of late years indigenous varieties have been discovered as far north as Rhodesia. They have probably been grown and the grain used as feed by the natives (such as Kafirs) from the earliest times. Even at present they furnish a very considerable amount of feed to the African tribes.

Their introduction to the United States of America dates back to about 1875, when the variety known as White Kafir was introduced. Of the three varieties, White, Red, and Black Hull Kafir, the last-named has been proved to be the best, and at present this is the variety which is mostly grown throughout the States. Some 750,000 acres are devoted to Kafir in the State of Kansas alone.

The Kafir type was probably the first grain sorghum to be grown in this State, although the first reference in the *Agricultural Gazette* (1892) was to the Dhurra type (Milo). At the present time Kafir is the grain sorghum best known among farmers.

The origin of Milo is uncertain. It is thought that it came from Africa; but all varieties, as far as South and Central Africa are concerned, are very much unlike Milo. A variety grown in Egypt, however, and known as Yellow Dhurra, is very similar to it. The introduction into America of this sorghum dates back as far as 1885, and it was probably not long after this that it was introduced into Australia. For many years it was grown in this State as Milo maize, sometimes as Yellow Milo maize, although there is no connection whatever between the sorghum and ordinary maize. When seed was obtained from Egypt it was often grown under the same name as in that country, such as Dhurra, Yellow Dhurra, &c. Thus a confusion of terms between Dhurra and Milo has arisen, whereas in many cases the two are identical.

The cultivation of Milo in this country has diminished to a considerable extent. This is probably due (1) to failure to appreciate the nutritive quality of the grain; and (2) the pendent or "goose-neck" seed heads, a characteristic which has been entirely eliminated during late years as the result of selection and acclimatisation.

Feterita is one of the newest varieties of grain sorghums. It is a white dhurra variety of North Africa, but should not be confused with the old white dhurra type known as Egyptian or Jerusalem corn and native to the Barbary States. Feterita appears to be a native of the Sudan. In that country the seeds are of a greyish tint, but are much whiter when grown in the United States. There is no doubt, however, that the seeds of the plants grown in this State are more greyish than pure white.

In America, Feterita is quite a recent introduction. Although first imported in 1901, it was not particularly noticed until 1912, when, with a rainfall of 15 inches for the year, it yielded in Texas 58 bushels to the acre. Since then it has maintained its reputation as one of the best grain-producing sorghums in dry districts, and on this reputation it has been imported into this State.

Manchu Kaoliang is probably one of the oldest grain sorghums grown; nevertheless its introduction into European countries is quite recent. A very complete description of this variety was written by Carleton Ball, the American Agronomist, in 1913, and much of the following has been culled from his bulletin.

The Kaoliangs, Ball says, comprise a group of grain-producing sorghums only recently introduced into cultivation. They are native to Eastern Asia, and are the only sorghums found there. The Chinese name is "Kaoliang," meaning literally tall millet, and pronounced "kowliang."

Among the names applied to this sorghum by Europeans in the East are Tall Millet, Great Millet, Large Millet, Giant Millet, False Millet, and Barbadoes Millet. It is probable that this group of sorghums was originally brought from China into India; but this introduction took place many centuries ago, and the forms as we find them to-day in China and Manchuria probably vary considerably from the original importations.

Kaoliang sorghum is probably the principal crop grown in Manchuria, but it is also cultivated largely throughout China, and, to a small extent, in Japan. In Manchuria every part of the plant is utilised—the seeds for grain and wine, the stalks for fuel, laths, fences, baskets, &c., the leaves for fodder, and even the roots are used for fuel. In Japan, Kaoliang is principally grown as a windbreak.

The official introduction of Kaoliangs into America commenced in 1898, and many varieties have been tested. Of all the types Manchu Brown Kaoliang appears to have given the best results, and it was this type which was imported into New South Wales three years ago.

Classification of the Grain Sorghums.

The four grain sorghums at present growing in this State may be distinguished from each other in accordance with the following table:—

Variety.	Leaf Growth.	Stems.	Heads.	Seed.	Order in which they mature.
Kafir ...	Abundant...	Thick, juicy, and slightly sweet.	Long and fairly large.	White, comparatively small, with black hulls.	4
Feterita ...	Fair ...	Thick, inclined to tiller; juicy in young stages, but becoming pithy on maturity; juice not sweet.	Plump and compact.	Large, greyish	2
Milo ...	Fair ..	Of medium thickness, juicy in young stages, but becoming pithy on maturity.	Compact, very heavy.	Yellowish brown, large.	3
Kaoliang...	Sparse ...	Thin and long; always pithy.	Loose to semi-compact; light.	Brownish ...	1

Where confusion may arise.—In Kafir and Feterita the seeds are whitish in tint. In Kafir, however, the leaf growth is very abundant, the heads are generally long, the seed is small, and the plant retains its sap right to maturity. In Feterita the heads are much more compact, and the stems become slightly pithy as the plant reaches maturity. The seed also is much larger, not so round in shape as Kafir, with a bluish tint, and generally marked with irregular concentric lines.

In Milo and Kaoliang the seeds are somewhat alike in colour, both being of a brownish tint, but that is as far as the resemblance goes. The plants of Kaoliang are taller and contain much more pith than the Milo, while the heads of the latter are much more compact, and the seeds far heavier than those of Kaoliang. The black hull of the Kaoliang seed, too, is very characteristic.

Manchu Kaoliang can often be confused with Planter's Friend, as far as outward appearances are concerned. The distinction, of course, is made clear by the saccharine sap of Planter's Friend and the non-saccharine pithy character of Kaoliang. The seeds of Kaoliang also separate much more easily from the hull than do the seeds of the other.

Results of Experiments in New South Wales.

Kafir.—Although Kafir has in the past been the principal grain sorghum grown in this State, few data were available as to yield and habits of growth until comprehensive experiments were conducted by the Department, commencing three years ago. It has been tried at Hawkesbury Agricultural College, and at Cowra, Yanco, Nyngan, and Wagga Experiment Farms. It stands out prominently amongst the grain sorghums for its very leafy growth, and more succulent appearance in general. The seed germinates very satisfactorily under moist conditions; but the growth is comparatively slow throughout the growing period, and in this respect it is easily left behind by the other sorghums. Kafir possesses good drought-resisting properties, and the leaf growth will remain green for a long period. This characteristic was particularly noted by the Experimentalist at Nyngan in the season 1915-16, which was very dry, when it was reported as retaining its verdure the longest.

Kafir has not succeeded yet, in any season, in setting seed at Cowra and Nyngan Experiment Farms. At Yanco Experiment Farm, under irrigation, however, and at Hawkesbury Agricultural College, with a good rainfall, some high yields of grain have been produced. At Yanco yields as high as 120 bushels per acre can be obtained, while at the College it has yielded 44 bushels against 40 of Milo.

There is very little to choose between the fodder yields of Kafir and those of Feterita and Milo, when grown inland under irrigation or in the coastal districts. Yields at Cowra were 4 tons 13 cwt. against 4 tons 4 cwt. of Milo, while at the College it produced 10 tons 1 cwt. against 9 tons 4 cwt. of Milo.

Kafir is the slowest of all grain sorghums to mature. In the interior it does not even show signs of flower until the others have almost matured their grain, while at the College in 1916-17 the figures given for maturing were—Kafir 112 days, Milo 98 days, Feterita 91 days, Kaoliang 75 days.

Owing to its inability to set grain in the interior, Kafir must be discarded as a grain-producing sorghum for those parts. The increase in fodder yields over those of Milo, Feterita and Kaoliang is also too slight to justify its growth for this purpose alone. Under irrigation it has so far succeeded best of all the grain sorghums in yield of grain, although there are strong indications that Milo, as it is improved in course of time by selection, will outyield it. On the coast, Kafir has proved undoubtedly the most successful of all the grain sorghums up to date. In coastal districts, however, the grain sorghums have maize to contend with from a grain-producing point of view; and it is only in districts where dry summer spells are fairly frequent, such as parts of the South Coast, that it can ever hope to compete with maize. From a fodder point of view much better results are, as a rule, obtained from the saccharine sorghums, such as Planter's Friend or Amber Cane, although the fungus which is rampant in the leaves of the sweet sorghums, and which is absent from Kafir corn, will probably be a matter for consideration in some districts. Some farmers are of the opinion, even now, that it pays, on account of this fungus, to grow Kafir in preference to Planter's Friend.

Milo.—Although Milo has been grown from time to time in this State, few data are available as to its success, and it has never been taken up to any extent. Experiments were first carried out on a systematic scale four years ago, and since then selection and acclimatisation have eliminated, to a considerable extent, the objectionable features noticed in the first year's crop, viz., its goose-neck, pendent heads, and the small yield of the seed crop. The Milo, as it is grown to-day at the Experiment Farms and in farmers' experiment plots, is far different from and superior to the Milo of four years ago.

Milo has been grown at Nyngan, Cowra, Wagga, Bathurst, and Yanco Experiment Farms, at Hawkesbury Agricultural College, and on farmers' experiment plots.

The germination of Milo seed has always been uniformly good, and it is not as sensitive to cold soils as is Feterita seed. Next to Kaoliang, it is the most rapid grower of all the sorghums. Tillering takes place when the plants are removed some distance apart, and under such conditions the crop sets its seed irregularly. The plant itself is fairly drought-resistant, but the grain yield is seriously affected by adverse conditions. Unlike Feterita, the heads will not hold out until favourable conditions arise, and if the season is a particularly dry one the yield is light. No amount of rain after the heads have once formed appears to increase the yield to any extent. It must be noted, however, that it requires little moisture to produce a good grain crop, and in this respect Milo is one of our best sorghums.

In all cases, with the exception of farmers' experiment plots at Wee Waa and Inverell, Milo has consistently given higher yields than any of the other grain sorghums. The seed is always bright, plump, and heavy, and particularly characterised by the long period it will hold on to the head after maturity. This factor is distinctly advantageous in the harvesting of the crop.

As a rule Milo produces more fodder than Feterita or Kaoliang, but not so much as Kafir. In the western districts, without irrigation, it will yield up to 4 tons of green fodder per acre, while under irrigation it will reach as high as 9 tons per acre.

Milo, as a rule, matures later than Feterita or Kaoliang; but as earliness in maturity is a desirable factor, selection is being carried out with a view to modifying it in this respect. Up to date Milo is the best grain sorghum growing in the western districts without irrigation, and with the normal rainfall. It may be exceeded in certain seasons by Feterita or even Kaoliang; but its uniformity in growth, its capacity for setting a heavy crop with a small rainfall, and, lastly, the superior nutritive qualities of the grain render it most attractive, and perhaps best adapted to the larger portion of our semi-arid districts.

Feterita.—This grain sorghum was introduced into this State about four years ago. It has been grown at Cowra, Nyngan, Bathurst, Wagga, and Yanco Experiment Farms, at Hawkesbury Agricultural College, and on several farmers' experiment plots. The seed of Feterita must be sown in warm soil if a good germination is desired. Failures have been recorded by sowing in cool wet soils, and it is the most sensitive in this respect of all the sorghums. Good seed has a high germinating capacity; the 1917-18 seed when tested gave a 98 per cent. vitality, and an excellent stand is therefore assured under favourable conditions. Feterita is rather slow in the first stages of growth, and the plants are inclined to tiller to a considerable extent. Whether this is advantageous or otherwise has not yet been decided. If the crop is desired for both fodder and grain the tillering may be a distinct advantage, but it leads somewhat to irregularity in the maturing of the grain. Although, as a rule, Feterita flowers later than Milo it matures its seed very quickly, and can generally be harvested before Milo. In farmers' experiment plots at Inverell and Wee Waa it matured its grain even before Kaoliang.

Feterita is an excellent sorghum to tide over dry spells, both the stems and heads holding on remarkably well until favourable conditions arise for the grain to form and mature, which it does very quickly. It matures grain under adverse conditions better than Milo, but not as well as Kaoliang. At Cowra and Nyngan, and also in a farmer's experiment plot at Tallewang, Milo yielded higher than Feterita, but in plots at Wee Waa and Inverell in 1917-18 it outyielded Milo (40 bushels against 30 in the first case and by 24 against 21 in the second). Generally speaking, yields varying from 20 to 30 bushels should be obtainable in most parts of the Riverina. At Nyngan Feterita has yielded less than Milo and more than Kaoliang, and at Cowra less than both. Generally speaking, owing to the limited height of the plant, which is much less than Milo and Kaoliang, it can hardly be expected to produce as much fodder as the other grain sorghums; but it is very quick in maturity, being at least second, and sometimes first, of all the sorghums. This is an important factor in dry-farming districts, and one which is always kept in view in the process of selection. Feterita is one of our most promising grain sorghums for the interior, and its value should be considerable as a summer grain-producing crop. Its ability to set seed under adverse conditions renders it superior to Kafir, and its heavy seed heads make it superior to Kaoliang. It can only be equalled or excelled in most parts by Milo.

Kaoliang.—This sorghum was not known in New South Wales until it was introduced four years ago. It has been tried in the same localities as the others with the addition of farmers' experiment plots at Casino and Milton, and also at Grafton and Glen Innes Experiment Farms.

Kaoliang is easily the most rapid grower of all the sorghums. Its seed always germinates satisfactorily, even in such cold soils as Glen Innes, and it is the first to appear above ground. As a rule it grows to a good height, with thin stems and not much leaf. It does not tiller or sucker in any way. Its roots are weak, and strong winds play havoc with the mature crop, levelling it to the ground in all directions. Hilling-up will eliminate this defect to a considerable extent.

Kaoliang is the most drought-resistant of all our sorghums, even more so than Kafir, inasmuch as it will not fail to set seed under the most adverse conditions. At Nyngan in the season 1915-16, which was extremely dry, 35 per cent. of the plants had flowered and set seed before any of the other sorghums showed any tendency to do so.

The seed yields have, up to the present, been extremely small on the coast, as well as with and without irrigation in the interior. The plants set seed very readily, and produce big heads, but the seed is very light, and the yields suffer in consequence. The highest yields have been 15 bushels to the acre at Nyngan and 30 bushels on the coast. These yields are above the average; but there is a strong probability that by selecting for compact heads the seed yields will be considerably increased.

The thin stems and sparse leaves seriously affect the fodder yields of Kaoliang. Nor is that all: the stems are extremely pithy, and practically negligible from a feeding point of view. Yields of 3 tons per acre have been obtained from it in the interior.

Kaoliang is easily the quickest maturing grain sorghum we have. At Hawkesbury Agricultural College it matured in 75 days as against 112 days for Kafir.

This sorghum possesses two characteristics which render it extremely useful under certain conditions. These are (1) its quick maturing habits, and (2) its drought resistance and capacity for setting seed under the most adverse conditions. Another feature, of slightly less importance, is its ability to set seed, even when the season is very wet. The rain does not appear to drown the pollen as in the other sorghums. Under normal conditions it is very inferior to Milo and Feterita; but the presence of such characteristics outlined above, combined with the possibility of considerably increasing the grain yield by selection, may eventually render it of great importance in our semi-arid districts.

Fodder Value of Grain Sorghums.

Mr. K. Goodsir, Experimentalist at the Women's Training Farm, Cowra, reports as follows:—

Feterita.—In the green stage stock appeared to eat the sub-acid growth eagerly.

Standard Milo, in the green stage, possesses practically the same value as Feterita, but does not have as much leaf growth to stem as this variety. Also sub-acid in taste.

Manchu Kaoliang was not popular with stock at any stage of its growth, the stems being woody and juiceless, with a minimum leaf growth. In the dry stage (after threshing) stock appeared to relish the heaps of Feterita and Milo to the same extent, but Manchu Kaoliang was altogether discarded.

Value of Grain Sorghums for Cowra.—From the results obtained at the farm they should be a very suitable and valuable crop, not only to the farmer of this district, but in all places where the rainfall is too low for the growing of maize. The nutritive value of these grain sorghums is very little under that of maize; and again, they do better in poorer soil and resist frosts better than the latter. Then again, Milo and Feterita are of value to the farmer as stock feed. They are sub-acid in taste and remain green right up to harvest. They should make good ensilage.

General Remarks on Grain Sorghums.

Time of Sowing.—Kaoliang can be sown earlier than the others, owing to the fact that it is not nearly as sensitive to cold conditions. Feterita must have fairly warm soil if a satisfactory stand is required. If it is desired to sow the four varieties at one time, this can be done early in October in the western and north-western districts, while on the Central Slopes and Riverina it would be better to wait until late in that month.

Rate of Sowing.—Just the exact amount of seed to sow per acre in different districts is still under investigation. Two factors must be considered, viz., (1) that the plants must not be too crowded in semi-arid districts if they are to gather sufficient moisture for their development; and (2) that by spacing too far apart in the rows, tillering is encouraged, which results in irregularity in the ripening of the seed—a distinct drawback as far as harvesting is concerned. It has been noticed at Nyngan that any space of over 9 inches tends to produce tillering. At present 4 to 6 lb. of seed per acre in rows 3 feet to 3½ feet apart seems to give good results, and for the time being this rate of seeding is recommended, though it is quite possible that as a result of experiments this rate will be modified. Under irrigation a heavier seeding can be given.

Cultivation.—Inter-row cultivation is absolutely essential. It serves two purposes, viz., suppression of weed growth and improvement of the moisture-holding capacity of the soil. Just as in maize-growing, good yields cannot be expected if the cultivation is neglected. All the grain sorghums, with the exception of Kaoliang, are very slow in their early stages of growth, and can easily be smothered by weeds unless cultivation is carried out, which should be deep at first, but less so as the crop grows, or the root system is injured.

When to Harvest.—The right time to harvest depends on the manner in which the crop is to be fed to stock. If it is desired to feed it whole—stem, leaves, and grain—it should be cut when the seed is in the firm dough stage.

The flag will remain fairly green and succulent up to this stage; but by the time the grain is quite ripe the stems have become quite pithy, the leaves dry and dropping off, and the feeding value of the green part of the plant considerably lessened. If, however, only the grain of the sorghums is desired, Milo and Feterita can remain some considerable time in the field without much deterioration or shedding of the grain. Kaoliang is the only grain sorghum likely to shed its seed if not harvested shortly after it is mature. Heavy rains, however, appear to seriously affect the colour, and possibly the feeding qualities of the grain of Milo when it is quite mature.

Method of Harvesting.—If the cutting of the whole crop is desired it will be found that it is too heavy for the wheat harvester, and a machine like the maize harvester is necessary. Cutting the crop by hand and soiling it like maize or Planter's Friend is neither practicable nor desirable, owing to the habits of the plant.

If the crop is grown for grain only there are different ways of dealing with it. The heads can be cut or broken by hand, as are the cobs in maize, and afterwards heckled, crushed, or fed whole. The ordinary grain-separator heckles the seed from the heads very readily. One of the best methods, however, of harvesting the heads is by means of the grain header—a machine after the style of the wheat header. If the crop is a uniform one, the wheat header could itself be used with advantage. If the cultivation of the grain sorghums is to be carried out in the future on a scale similar to that of maize, machines like these will become essential.

Methods of Feeding.—Grain sorghums can be fed in the bundle without threshing the seed, or the grain can be fed alone. If fed whole, it is necessary to cut, bind, and stook in the field. Care should be taken not to place too much in the barn at a time, owing to a tendency to develop mouldiness. The grain is much more digestible when fed cracked than when fed whole. If none of the teeth of the grain separator are removed, most of the grain can be cracked in the heckling process.

Nutritive Qualities of the Seed.—That the seed of grain sorghums has a high nutritive content has been proved absolutely, both in actual feeding experiments and by chemical analysis. This nutritive value of the grain is increased by feeding with a leguminous plant such as lucerne. The value of Kafir has been found to be only slightly less than that of maize; while the official analysis of the grain sorghums in this State showed that Milo had a higher feeding value than Kafir.

Where the Grain Sorghums are Valuable.—In those districts where maize-growing is impracticable or is undertaken with a risk, nothing better could be grown than the grain sorghums as a summer crop. Even on the Murrumbidgee Irrigation Area it is quite probable that grain sorghums will yield better and produce better returns than maize, if they were used as they should be. The value of good summer crops to the mixed farmer is of great moment. At the present time late summer and early autumn are generally critical periods for the sheep, and a crop of grain sorghums, whether grown for ensilage, hay, or grain, would be of considerable assistance. Farmers who have tried these sorghums during the past two years all speak well of them; and when minor difficulties, such as methods of harvesting and feeding, are overcome they should become popular and be grown much more extensively than at present.

Value of Selection and Acclimatisation.—It would be difficult to find a plant that will improve more as the result of selection and acclimatisation than either Milo or Feterita. The improvement over each preceding year's crop at Nyngan has already been referred to in this *Gazette,* and last season, 1917-18, with a rainfall of an inch less than the previous year, both Milo and Feterita yielded 4 bushels to the acre more than in 1916-17. A big improvement was also noticeable at Cowra, although no exact data are available.

There were several objectionable characteristics in Milo when first grown. Amongst these were (1) goose-neck or pendent heads; (2) free stooling; (3) free branching; (4) absence of uniformity in height and size of the plant. Goose-neck heads are very awkward to harvest, and also ripen more unevenly, owing to shading, than erect heads. Free stooling and branching lead to irregular ripening of heads, as they do not all seed at the same time. Absence of uniformity in size of plant renders harvesting difficult, and also makes threshing awkward if the latter is done in the bundle. Now, as the result of selection, the goose-neck or pendent heads have been entirely eliminated in Milo and Feterita at the Experiment Farms, while free stooling and absence of uniformity have been considerably lessened. Just as in the case of maize, the farmer growing these sorghums can continually enhance the value of his crop by paying attention to desirable characteristics and selecting for the same. To avoid free stooling, the previous remarks concerning wide spacing in the rows should be noted.

Increase in Yield by selection.—In selecting for increase in yield of grain, compactness and fullness of head should be chosen. The tendency towards "branching" in the head should be severely discouraged. Milo heads will often be found with branches at the base of the head, bearing none or little seed. These should always be discarded. It has to be remembered that in growing grain sorghums for grain the height and size of the plant need not be taken into account. Plants bearing the largest, most compact heads, should be chosen, due regard being paid to the desirability of having the height and size of the plants as uniform as possible.

Summary.

Grain sorghums are amongst the earliest crops cultivated, dating back as far as 2500 B.C. The grain was, at one time, the chief source of diet amongst the human population of the earth. The principal grain sorghums of economic importance are Kafir, Milo, Feterita, and Kaoliang.

Kafir sorghum is a native of South Africa, and, until just lately, has been the best known and most grown in European countries.

Milo probably originated in North Africa. It is only quite recently that its cultivation in America has been carried out to any extent.

Feterita originated in the Sudan, and, although of the White Dhurra type, it is distinct from Egyptian corn. It is becoming increasingly popular in the United States.

Kaoliang is a native of Eastern Asia, and although a very old sorghum it is the latest arrival in America. It is probably the principal crop grown in Manchuria.

Both Feterita and Kafir have whitish seeds, and Milo and Kaoliang brownish seeds, but differences in the stem and shape of heads distinguish them from each other.

Kafir produces fair fodder yields, but no grain, in semi-arid districts. It is the slowest maturing of all the sorghums and can only be recommended under irrigation and for parts of the coast.

Milo is an excellent sorghum for semi-arid districts and for irrigated areas. Yields of 30 bushels and upwards can be expected.

Feterita at present shows a tendency towards tillering, but in all other respects equals Milo.

Kaoliang produces seeds very quickly and under adverse conditions, but the yields are generally light.

Grain sorghums are admirably adapted as summer crops in those semi-arid districts where maize-growing is not practicable. Sow 4 lb. to 6 lb. per acre in October, in drills to allow for inter-row cultivation.

The crop can be harvested or fed whole, or only the grain utilised. In the former case a special machine like the maize-harvester is necessary.

It is better to feed the grain cracked than whole. The process of heckling by the grain separator will crack most of the grain.

The seed has a high feeding value, practically equal to that of maize.

Great improvement can be effected by selection and acclimatisation.

LIST OF PLANTS DECLARED TO BE NOXIOUS IN VARIOUS SHIRES AND MUNICIPALITIES DURING AUGUST, 1918.

Plant.		Shire.	Municipality.
Scientific Name.	Common Name.		
Echium plantagineum .	Paterson's Curse ...	Mumbulla.	
Lycium barbarum	African Box Thorn ...	Patrick Plains ...	Singleton.
Marrubium vulgare	Horehound	....	Junee.
Phytolacca octandra ...	Red Ink Plant ...	Mumbulla.	
Rosa rubiginosa	Sweet Briar	Kyeamba.	
Rubus fruticosus	Blackberry	,,	
Xanthium strumarium ...	Noogoora Burr ...	Manning.	

WORM INFESTATION IN SHEEP.

WORM infestation in sheep occurs mainly in the Central and Eastern Divisions, and has been more pronounced recently on account of wet seasons and as the result of fresh pastures becoming contaminated by infected animals being brought on to them.

There are many varieties of worms, stomach and intestinal, and to prevent infestation and reinfestation is no easy matter, but the high prices now ruling for sheep justifies every effort in that direction.

Treatment for stomach and intestinal worms consists of drenching, but for lung worm it is not efficacious. However, as sheep affected with lung worm are usually also affected with either stomach or intestinal worms, a drench will, as a rule, expel these, and the sheep being relieved of its worst enemy naturally does better and improves in condition. Lung worm requires special treatment, such as intra-tracheal injection or fumigation, but should only be employed by persons having previous experience.

Probably the most efficacious is the arsenic drench. To prepare it, take 1 oz. arsenic, 2 oz. carbonate of soda (washing soda), boil in about a quart of water till thoroughly dissolved (half an hour at least), allow this to settle and cool, then pour off the clear liquid, burying deeply any sediment remaining, and add sufficient water to make up to 3 gallons. The dose of this is—for grown sheep, 2 oz.; weaners, 1½ oz.; and lambs 6 months old, 1 oz.

Other drenches consist of :—

Copper Sulphate (Bluestone).—Take ½ lb. pure bluestone, powder it well, and dissolve in about 2 quarts of boiling water. Add sufficient water to make up to 4½ gallons. Dose: grown sheep, 2 oz.; weaners, 1½ oz.; lambs, 1 oz.

Gasoline—Motor Petrol—and Raw Linseed Oil or Milk.—The dose is—for grown sheep, ½ oz. gasoline in 1 oz. of either oil or milk; lambs, ¼ oz. in 1 oz. of either oil or milk. If mixed in a quantity it must be kept well stirred while drenching. (Gasoline must not be mixed with water.)

Oil and Turpentine.—Raw linseed oil two parts, turpentine one part. Mix thoroughly, and keep well stirred. Dose: Grown sheep, 2 oz.; lambs, 1 oz.

The sheep should be yarded over night, and drenched the following morning, and kept in the yard for a couple of hours after drenching, and not allowed access to water in the meantime. In the case of badly infested sheep it is advisable to repeat the treatment in about three weeks or a month. In addition to drenching with any one of these drenches, the sheep should always be provided with suitable licks, and kept on *the best feed possible.* A good lick is composed of:—

Sulphate of iron	1 part.
Bone-meal, or calcium phosphate	5 parts.
Liverpool salt	30 ,,

or—

Lime	5 parts.
Sulphur	5 ,,
Liverpool salt	40 ,,

S. T. D. SYMONS, M.R.C.V.S., Chief Inspector of Stock.

The Cultivation of Maize.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

AFTER-CULTIVATION AND TREATMENT.

It does not seem necessary to stress the importance of the after-cultivation of maize, for almost every farmer knows that less cultivation means a lower yield, yet there are some methods in use which seem to be adopted from long practice, which are not sound, and will not stand the test of comparative trial, or which may only be justifiable under certain conditions. The details of cultivation need modification according to circumstances; and the farmer who cultivates best is the one who cultivates intelligently, not according to a fixed rule for all times and places, but according to good judgment, with a knowledge of the reason for and the effect of different methods. Curiously enough, there are some who believe that a retardation or checking of the growth of maize, especially in the early stages, is beneficial; but it can be definitely stated here that when this is effected by absence of cultivation or improper cultivation, the practice cannot stand the light of reason nor of actual result. The best yields of maize have always been obtained from crops that "grew every day," and cultivation can play an important part in effecting this desirable condition.

Reasons for Cultivation.

The reasons for cultivation may be briefly stated as follows:—

1. The prevention or destruction of weeds and grasses, which would otherwise become so formidable as to seriously rob the maize plants of moisture and plant-food material. Dormant weed seeds present in the soil are also started by cultivation, and killed while young by the following cultivation.

2. The conservation of soil moisture and its prevention from evaporation from the surface of the soil by the formation of a loose mulch of soil.

3. The admission of a supply of fresh air to the roots of the plants, which is essential to their proper functioning. This is especially valuable on heavier clay soils, which are apt to become "logged" with excess moisture and foul air.

4. The rendering available of plant-food material and the hastening of nitrification which should be encouraged, especially in early spring, as this process is somewhat slow at this time of the year. There are some farmers who believe in thorough cultivation rather than the use of fertilisers on rich alluvial soil, and there is every justification for believing that their opinion is in some measure correct under such circumstances, as there are many cases where their methods have been borne out by practical results and systematic experiments.

5. The disturbing and destruction of insect pests in the soil, such as aphids, earworms, army worms, cutworms, &c.

6. The control of soil temperature—more especially in the warming of cold soil to a condition favourable to assimilation by the roots and the consequent growth of the crop.

It should be borne in mind that evaporation from the soil lowers its temperature. This is a consideration in cold districts, when it can be prevented by keeping a loose, open soil mulch on the surface by cultivation.

The importance of keeping the weed growth in subjection is borne out by experiments carried out in Illinois,* where, with the same preparation of the seed-bed, an eight-year average gave a yield of 7·3 bushels of maize per acre where weeds were allowed to grow, and 45·9 bushels where the weeds were kept down without any cultivation.

Some rather remarkable results are quoted by Cates and Cox† to show the importance of keeping down weeds over all other reasons for cultivation. In an average of forty-seven tests, fields on which the weeds were kept down gave a yield of 37·1 bushels per acre, while those cultivated in the usual way yielded only 2·1 bushels more. It is stated that " the weeds were kept down by a horizontal stroke of a sharp hoe at the surface of the soil, particular care being taken not to disturb the soil or form a soil mulch." The conclusion arrived at by these authors is that "cultivation is not beneficial to the corn plant except in so far as removing weeds is concerned." It would not be advisable to accept this statement as applicable to the conditions of maize-growing in this State until some tests are made. It is felt, however, that these results must apply to thoroughly prepared soil, with absence of conditions under which the soil becomes beaten down by heavy rain, such as often occurs in this State on stiffer clay soils, when it seems difficult to realise that cultivation would not have a very beneficial effect.

Although these experiments were apparently primarily designed to show the importance of keeping down weeds, it is evident that no recommendation can be made for treating the maize crop by the method of keeping weeds down with the hoe, except, perhaps, on very small areas, or with cheap labour. The lower cost of cultivation with horse implements must throw the balance decidedly in favour of this method, but the data show the importance of killing the weeds whatever form of cultivation is used.

Harrowing the Growing Crop.

The first cultivation usually given after planting is a light harrowing to level the field for a uniform depth of covering on the seed, and to further break down any clods of too large a size. This harrowing may take place directly after sowing, or may be delayed a few days. When the field has been rolled for planting, this harrowing should not be too long delayed. If rain falls soon after planting on heavy soils, a harrowing is essential to break the crust which forms, in order to allow the tender plants to come through. Harrowing before the crop is through is often absolutely necessary in irrigation districts. When the land contains undecayed stalks, grass, or weeds, it will not be advisable to give this harrowing at a time when the young plants are about to push through, for the rubbish collecting in the harrow will tear out many of these tender plants and kill them by exposure to the hot sun. In any case, harrowing at this time, or in such a case, should always be done with lever harrows, in which the tines are well tilted backwards.

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* Illinois Agr. Exp. Sta. Bulletin 181 (1915).

† U. S. Dept. Agr. Bureau of Plant Industry Bulletin 257 (1912).

After the plants are up sufficiently to clearly distinguish the rows, the harrowing should be continued. This is a practice which is new to a very large number of maize growers in this State, but its advantages are :—

1. It readily kills a big crop of young weeds which may later become so formidable as to necessitate costly methods of eradication. This applies particularly to the weeds in the rows with the maize, which are the most difficult to deal with.

2. It starts a number of weeds, which can then be easily dealt with by a subsequent harrowing or cultivation.

3. It prevents the formation of a crust on heavy soils, which on cracking allows the escape of soil moisture.

4. It creates a surface mulch of loose soil, which checks evaporation, allows rain to penetrate, and prevents much run-off and soil erosion.

5. The large area which can be covered in a little time is a big consideration, and means the saving of considerable cultivation at later stages by more costly methods. Twelve or fifteen acres per day may easily be accomplished with a light harrowing.

There are a few important precautions to be observed when harrowing the growing crop of maize :—

1. The harrow should be light, especially on small plants or on sandy soil. The best type is a lever harrow with long narrow tines, which can be tilted backwards.

2. The harrowing should not be done during the early morning or late evening, or on a cool day when the plants are brittle, but during the heat of the day (the warmer the day the better) when the plants are supple.

3. The harrow should be kept free from rubbish, as it is the collection of anything of this nature between the tines which causes the greatest damage in tearing plants out.

More care is necessary in harrowing on sandy soils than on loams or heavier soils, but even here this should not be made an excuse for omitting the operation.

When the soil is somewhat open or cloddy, as may sometimes happen respectively on a light soil or on a heavy soil, which dry weather has kept from working to a good tilth, and where a rolling is considered advisable after the crop is up, this operation can be performed with benefit if the precaution of doing it during the warm part of the day is observed. A good harrowing leaves the plants in the same condition as a rolling, *i.e.*, almost flat on the ground, but the following morning will find them once more erect and vigorous. Rolling should always be followed by harrowing at this time of the year. This harrowing, if left for two or three days, will kill a good crop of young weeds which have been induced to start by the rolling. Rolling, or a light harrowing, is especially a desirable practice on a young maize crop planted in furrows. Either operation has the effect of gradually filling in the furrows enough to smother a crop of young weeds starting in the furrows without injuring the maize, which should be allowed to get high enough to obviate this danger.

Harrowing the growing maize crop can be done until the plants are 6 or 8 inches high, when cultivation must commence. In some States of America an implement known as the weeder, with long narrow tines, takes the place of the harrow, and is used on crops 12 or 15 inches high. It covers three rows at once, and its use saves a considerable amount of after-cultivation by dealing with the weeds when they are tender and easily killed, while the vigorous maize plants are unaffected.

Depth of Cultivation.

Although maize roots have been found to penetrate to 4 or 5 feet on good soils, the crop is not as deep-rooting as most others. This is especially to be observed in the later stages of growth in which the bulk of the feeding roots are situated in the surface soil. The lateral spread of the roots is also a surprise to many maize growers who observe it for the first time. The accompanying illustration (Fig. 1) shows the development of the roots between rows of maize two months after planting (*i.e.*, before tasselling) in Kansas (U.S.A.), and shows at a glance what should be the best cultivation for the maize crop.

When the plants are about 12 or 18 inches high the roots will be found to be about 6 inches from the surface between the rows, gradually approaching to within 3 or 4 inches of the surface, 6 or 8 inches from the maize plants. After this, a large number of feeding roots approach to within 3 or 4 inches of the surface between the rows. The lateral spread of the roots depends on the dryness of the soil, the roots extending very quickly in a dry soil. In a dry season at Grafton during the early growth, roots were found to have extended 3 feet laterally towards the adjacent row by the time the plants were 18 inches high. In a more normal season the roots of adjacent rows 4 feet apart were found to be interlaced when the crop was not quite 2 feet high. In a wet season the roots will not have spread so far.

From these observations, the following recommendations regarding depth of cultivation can be made :—

1. Deep cultivation should not be given close to the rows, but may be given between the rows in early growth.

2. Shallow cultivation throughout should be the rule after the plants are about 18 inches or 2 feet high.

In a wet season deeper cultivation can be given, not only because the roots do not spread so quickly, but because a little root pruning does not do so much harm. For the same reason that great care must be used in transplanting vegetables in dry weather, while they can be treated more roughly in cool, wet weather, the depth of cultivation of the maize crop is most intelligently

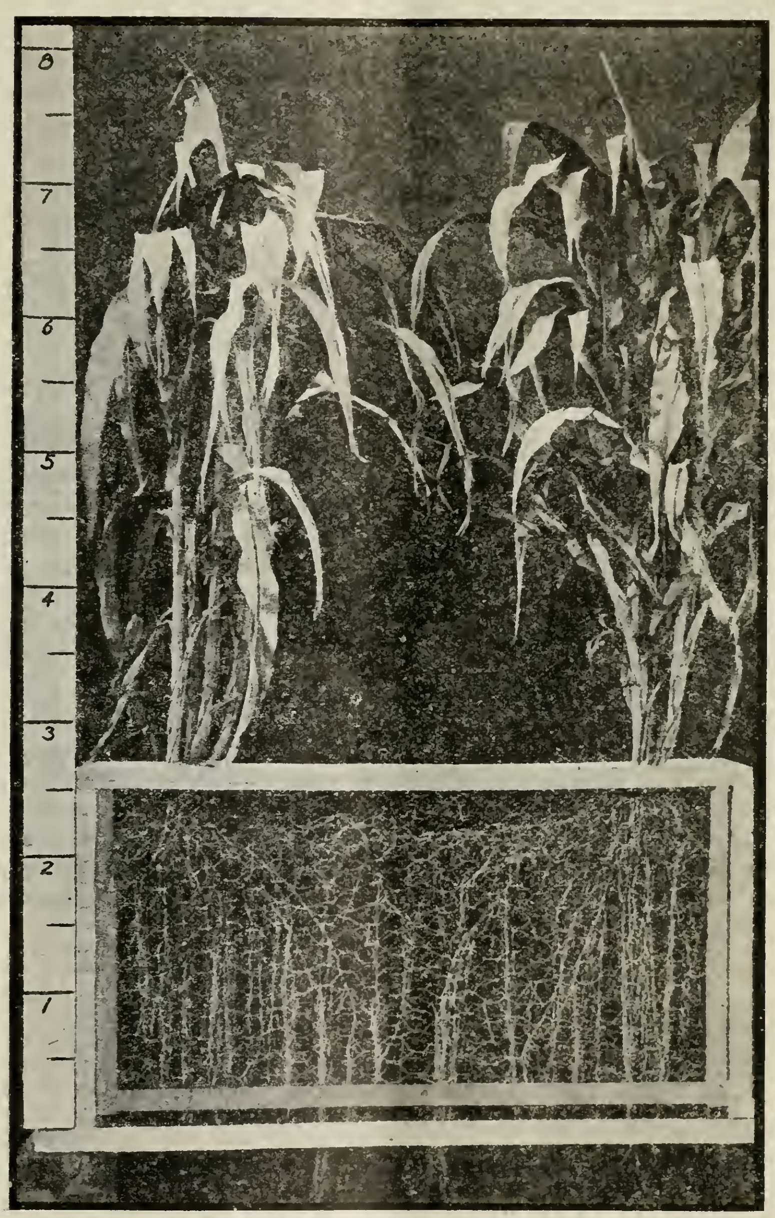

Fig. 1.—Showing distribution of roots between two hills of level-planted corn sixty days after planting. (*From Bulletin No. 127 of Kansas State Agricultural College.*)

THE CULTIVATION OF MAIZE.

decided by the season and condition of the soil. In a wet season weeds may unavoidably get ahead, or the soil may be too tightly packed, and deep cultivation may be necessary. Where this is the case, less harm will be done by the destruction of some of the feeding roots of the maize by deep cultivation than by not dealing effectively with the weeds. Under ordinary conditions, however, deep cultivation is to be avoided after the plants are about 18 inches or 2 feet high.

Experiments carried out in Ohio* during ten years gave an average yield of 56·4 bushels per acre for deep cultivation (4 inches), and 60·4 bushels for shallow cultivation (1½ inches).

An average of two years in Missouri† gave a yield of 66·9 bushels per acre for shallow cultivation and 53·5 bushels for deep cultivation—four cultivations being made in each case.

In other States of America increased yields of from 6 to 10 bushels per acre have been recorded in favour of shallow cultivation.

To show the injurious effect of root pruning, experiments were carried out in Illinois‡ with plots in which shallow cultivation was performed throughout, but in one series of which the roots were pruned or cut through below the depth of cultivation. An average of five years gave a yield of 75·8 bushels per acre on the plots where the roots were unpruned, and 64·2 bushels per acre where the roots were pruned. The effect of root pruning was to stunt the growth of the crop; and although this might be desirable in some cases in the early growth of a crop in dry districts, it is not beneficial in the recognised maize-growing districts where good crops can be expected.

The depth of cultivation also depends to some extent on the number of cultivations to be given, or the time of the last cultivation. As a general rule, it may be stated that the more frequent the cultivation the shallower it should be, and when the cultivation is not to be continued late into the growth of the crop, the last cultivation can be comparatively deeper, because the prevention of evaporation, or of compacting on a heavy soil, is secured for a longer period with a deeper mulch. For this reason also, the depth of cultivation should be comparatively greater in a dry climate.

A good, deep cultivation is sometimes given, and is often necessary on a heavy soil, before harrowing the growing crop. A deep cultivation in this early stage of growth of the maize also encourages downward rooting.

In the later stages of growth it has been observed that the first 8 inches of soil contain a large majority of the total roots of the plant, and that of these 8 inches the fourth inch from the surface contains the greatest proportion of roots.

A special implement called a surface cultivator (of which an illustration is shown in Fig. 2) is used to a large extent in America for cultivating maize at a shallow depth. It has wide sweeps (up to 30 inches in width) which can be set to any angle, and which travel about 2 or 3 inches or so below the surface of the soil, cutting through the roots of weeds and making this depth of soil mulch behind it. It is not likely to work too well on heavy soils which have become compacted by rain unless preceded by deep cultivation, but should be a valuable implement on our sandy loams and light loams.

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* Ohio Agr. Exp. Sta. Bulletin 140.
† Missouri Agr. Exp. Station Bulletin 39.
‡ Illinois Agr. Exp. Station Bulletin 181 (1915).

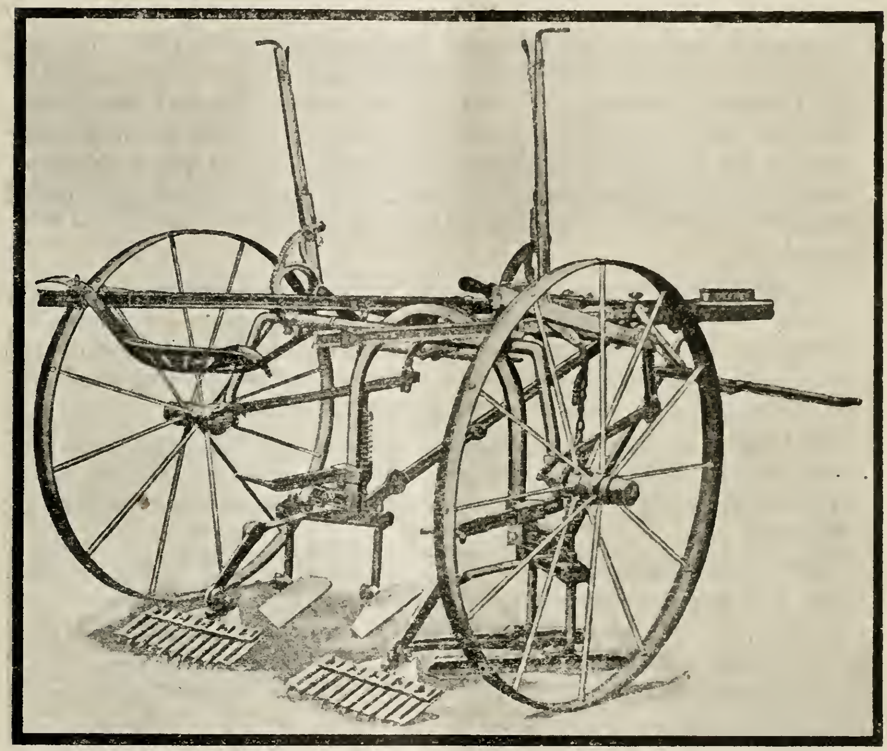

Fig. 2.—A combination surface and shovel cultivator which is new to this State, but which is largely used in the United States.

Time and Frequency of Cultivation.

The time and frequency of cultivation depends to a large extent on the condition of the soil, the season, and the amount or state of weed growth.

Most farmers know well enough that the best time for cultivation is when the best tilth is produced by such cultivation—*i.e.*, when the soil is neither too wet nor too dry. No excuse can be given for cultivation when the soil is wet, except it be on light soils when the weed growth is becoming formidable. The large amount of soil put out of good tilth by cultivating a heavy soil when wet justifies leaving the weed growth a little longer, even if it has to be dealt with more drastically. On light sandy soils during a wet season it is probably better to endeavour to check the weed growth by cultivation even if the weeds cannot be killed. The trouble with weeds is an important factor in amount of cultivation given; and due regard must be paid to the size of the weeds when determining the time of cultivation, always remembering that the killing of weeds while small and tender will be the means of saving considerable labour later on.

There is no doubt that many farmers leave off cultivation too early, *e.g.*, when the crop is knee high or waist high. On heavy soils especially the soil is often observed to run together and crack badly, permitting the escape of considerable moisture after this stage, which must reduce the yield. In such cases shallow cultivation should be continued right up to tasselling, more for the purpose of breaking the crust and preventing this evaporation than anything else. It is so well known that from the tasselling to the cobbing stage is the critical time with maize (this is because the plant uses more water at this time than any other), and greater endeavour should be made to keep the moisture in the soil than to helplessly depend on rainfall at this period.

Experiments carried out in Minnesota* showed that the yields of grain per acre increased from 45 to 62 bushels per acre by increasing the number of cultivations from two to six. Taking into account the increased cost of the extra cultivation and harvesting, four to six cultivations gave an increased profit of nearly £1 per acre over two to three cultivations.

In Ohio† a two-year average gave an increased yield of 3·44 bushels per acre in favour of late cultivation over ordinary cultivation. The late cultivation in this instance consisted of three extra workings with a single-horse cultivator.

The results obtained from experiments in the time of "laying by" the crop, or giving the final cultivation, in Mississippi,‡ were as follows:—

	1911.	1912.	
Maize waist high	34·1	31·2	bushels per acre.
Maize beginning to tassel	47·5	45·3	,, ,,

Late cultivation, which must necessarily be done with a single-horse implement (and preferably with the horse muzzled), should always be shallow. In the Inverell district, where many of the best farmers grow maize in wide rows, 5 feet apart, late cultivation is often done by driving a single leaf of the harrow up between the rows.

Reckoning the cost of a single-horse cultivation, it is estimated that it would only require at the most an increase of ½ or ⅔ bushel of maize to pay for it.

In irrigation districts it is easy to over-irrigate the maize crop for grain in the early stages of growth, but it is almost impossible to over-cultivate it; at least two or three cultivations can well be given for each irrigation of the young crop.

(*To be continued.*)

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* Minnesota Agr. Exp. Station Bulletin 149 (1915).
† Ohio Agr. Exp. Station Bulletin 282 (1915).
‡ Mississipi Agr. Exp. Station Bulletin 170 (1915).

Farmers' Experiment Plots.

WHEAT AND OAT HARVEST, 1917-18.

WESTERN DISTRICT.

R. G. MAY, formerly Assistant Inspector of Agriculture, now Manager,
Bathurst Experiment Farm.

EXPERIMENTS were carried out in the year under review on the farms of and with the co-operation of the following:—

Mr. D. A. Rich, "Roselayne," Wellington.
Mr. J. Parslaw, "Kelvin Grove," Collie-road, Gilgandra.
Mr. A. Milgate, "Rock Vale," Coradgery, *via* Parkes.
Mr. J. Franks, "Clear Hills," Back Yamma road, Parkes.
Mr. E. A. Draper, "Harris Park," Alectown West, *via* Parkes.
Mr. W. H. Jackson, Nelungaloo, *via* Parkes.
Mr. S. J. Reilly, jun., Eurimbla, *via* Molong.
Mr. D. Berrell, "Bellvue," Euglo, *via* Condobolin.
Mr. H. J. Clements, "Curraweana," Cowra-road, *via* Grenfell.
Mr. S. G. MacCauley, "Osterley," Ootha.
Mr. W. Burns, "Goongirwarrie," Carcoar.
Mr. M. F. Dalton, "Duntryleague," Orange.
Mr. C. J. Hopkins, Oxlea, *via* Dubbo.
Mr. W. R. Werner, "Pinefields," Nymagee, *via* Hermidale.
Mr. S. H. Robinson, care of S. H. Dowd, Tallewang.
Mr. W. R. James, Ulan.
Mr. F. S. Stacey, "Combandry," Gulgong.

Owing to a disastrous hailstorm at the stage of ripening off, the experiment-plots on the farm of Mr. C. J. Hopkins, Oxlea, Dubbo, were so damaged as to be unfit for harvest. No results from this area are, therefore, available. At Ootha, on Mr. MacCauley's farm, the plots were so affected by the attacks of mice and by weather damage that no results were secured.

The thanks of the Department are due to all the above farmers for the kindly co-operation given and the keen interest evinced in the work.

Cultural Notes.

Wellington.—Soil, strong red loam; mouldboard-ploughed 4 inches deep on 29th September, 1916; skim-ploughed 30th October, 1916; spring-toothed 28th January, 1917; disc-ploughed first week in April, 1917; harrowed and drilled 3rd and 4th May, 1917.

Gilgandra.—Soil, chocolate loam; disc-ploughed July, 1916; one-way disced October, 1916, again in January, 1917, and on 14th February, 1917; spring-toothed 29th April, 1917; drilled 22nd and 23rd May, 1917.

Coradgery.—Soil, red loam (virgin soil); mouldboard-ploughed 4 inches deep during August and September, 1916; spring-toothed 24th to 28th October, 1916; mouldboard-ploughed 13th to 16th March, 1917; spring-toothed and drilled 4th and 5th June, 1917.

Parkes.—Soil, chocolate loam; disc-ploughed 5 inches deep middle of March, 1916; spring-toothed in July, 1916; one-way disced in September, 1916; spring-toothed and drilled 25th, 26th and 27th June, 1917.

Alectown West.—Soil, grey sandy loam; disc-ploughed August, 1916; one-way disced September, 1916; harrowed end of September, 1916, and again in November, 1916; harrowed January, 1917; one-way disced in May, 1917; drilled 2nd, 3rd and 5th June, 1917.

Nelungaloo.—Soil, strong red loam; disc-ploughed 4 inches deep in August, 1916; spring-toothed in October, 1916; one-way disced in February, 1917; drilled 5th and 6th June, 1917.

Eurimbla.—Soil, medium red sandy loam; mouldboard-ploughed 4 inches deep in June, 1916; mouldboard and disc ploughed in September, 1916; one-way disced in May, 1917; drilled 8th and 9th June, 1917.

Condobolin.—Soil, red loam; disc-ploughed first week in January, 1917; spring-toothed middle of May, 1917; drilled 28th and 29th June, 1917.

Grenfell.—Soil, grey sandy loam; disc-ploughed 6 inches deep in November, 1916; one-way disced early in March, 1917; spring-toothed and drilled 29th and 30th May, 1917.

Ootha.—Soil, medium red loam; disc-ploughed first week in March, 1917; spring-toothed in April; harrowed and drilled 18th and 19th June, 1917.

Carcoar.—Soil, grey light clay (granite origin). Wheat portion—mouldboard ploughed in February, 1917; spring-toothed in April, 1917; spring-toothed and drilled May, 1917. Oat portion—Previous crop potatoes, which were dug in April, 1917; mouldboard-ploughed end of April, 1917; spring-toothed and drilled 30th May, 1917.

Orange.—Soil, red loam; mouldboard-ploughed in October, 1916; one-way disced in December, 1916; mouldboard-ploughed first week in March, 1917 drilled 30th April, 1917.

Dubbo.—Soil, grey clayey loam; mouldboard-ploughed September, 1916; harrowed in November, 1916; one-way disced December, 1916; rolled and spring-toothed in March, 1917; spring-toothed and drilled 7th and 8th May, 1917.

Nymagee.—Soil, medium red loam; mouldboard-ploughed in August, 1916, 4 inches deep; harrowed second week in September, 1916; skim-ploughed middle of December, 1916; spring-toothed third week in February, 1917; spring-toothed both ways first week in April, 1917; harrowed and drilled 24th and 25th May, 1917; harrowed after sowing.

Tallewang.—Soil, dark grey sandy loam; disc-ploughed 4 to 5 inches deep 19th September to 3rd October, 1916; spring-toothed 20th to 23rd February, 1917; skim-ploughed 18th April, 1917; drilled 9th, 10th, and 11th May, 1917, and harrowed after seeding.

Ulan.—Soil, grey sandy loam; ploughed in January, 1917; spring-toothed both ways last week in March, 1917; disc-cultivated 9th May, 1917; drilled 11th, 12th, and 14th May, 1917.

Gulgong.—Soil, strong red loam; disc-ploughed 4 inches deep January, 1917; one-way disced 4th May, 1917; drilled 15th May, 1917.

Rainfall.

The rainfall may be summarised as follows:—

TABLE I.—Showing amount of Rainfall on fallow and growing crops, Western District, 1917–18.

Locality.	Rainfall on Fallow.	Rainfall on Growing Crop.
	inches.	inches.
Gilgandra	22·33	10·35
Grenfell	*	28·74
Carcoar	*	23·69
Gulgong	2·93	22·6
Ulan	*	23·65
Tallewang	18·56	21·14
Wellington...	*	21·59
Orange	*	26·72
Alectown West	*	16·06
Eurimbla	*	18·75
Coradgery	17·93	16·81
Parkes	*	14·00
Condoboiin	15·99	12·22

* Not available.

Notes on the Season.

The season under review did not make a favourable commencement. The preceding cropping season was one of unusual wind, rain and hail storms. These conditions, aided by the humidity of the atmosphere, brought about a widespread attack of rust, which conjointly with the damage by storms caused serious losses to large numbers of farmers, and many share farmers were compelled to seek other occupations. The rainy conditions continued until early in February, 1917, from which time until 8th June, 1917, a state of drought practically existed over the greater portion of the Western District.

Mice were in plague proportions on the Western Slopes. In many districts the paddocks were badly infested with the rodents, who dug up the grain after it had been planted in several instances, and later nibbled off the young shoots, digging down to obtain the sprouted grain. In several crops inspected it was rare to find any young shoot that had not been nibbled, and efforts made to secure the grain. This was most noticeable at Ootha, and it was largely due to the damage done by mice, and later by storms, that results were not available.

Results were unobtainable from the experiment plots on the farm of Mr. C. J. Hopkins, Oxlea, Dubbo, owing to a severe hailstorm which passed over the district when the wheats were at the ripening stage. An inspection of these plots immediately on the cessation of the storm showed that Penny, a Victorian mid-season wheat, suffered less damage than the other varieties. Throughout the whole Western District practically every experiment plot was affected to some extent by wind and rain storms.

Rust made an appearance in several localities, but the weather conditions were unfavourable for the proper development of the disease, with the exception of the Orange plots, where rust heavily attacked certain varieties, notably Warden.

The results from various experiments are contrary to expectations under average conditions—such differences are due to the weather conditions experienced during the period of growth. The majority of the sowings were made in dry seed-beds. The germination throughout was good.

Comments on Varieties.

The results of the variety trials show wide variation, the yields ranging from inferior to abnormal returns. The following table shows the range in yields in some of the varieties.

Variety.	Locality.		Yields.				Difference—approximate.
	Minimum.	Maximum.	Minimum.		Maximum.		
			bus.	lb.	bus.	lb.	bus.
Firbank	Gulgong ...	Gilgandra ...	4	56	35	55	31
Improved Steinwedel ...	,, ...	,, ...	6	49	40	27	33½
Federation	Ulan ...	Tallewang	15	5	46	4	31
Hard Federation ...	,, ...	,, ...	8	0	40	50	33

These differences in yield are mainly due to one cause—the difference between good and mediocre farming methods. Until farmers realise that all produce gained in excess of that necessary to recoup the cost of production is practically net profit, and that the ratio of productivity increases rapidly in comparison with the cost of production on well worked farms, we shall still see farmers following in the rut of careless farming. The time has also come for the question of "Varieties of Wheat" to be given greater consideration. The Department recommends a considerable number of varieties of wheats suitable for all districts and for all purposes. These wheats have been secured by many methods—cross-breeding, hybridisation, selection and importation, so that now the farmer in any section of the State should have no difficulty in securing a wheat suitable to his soil, climate and farming conditions.

TABLE II.—Showing Results of Wheat Variety Trials, Western District, 1917–18.

Variety.	Nymagee.	Grenfell.	Gilgandra.	Parkes.	Coradgery.	Alectown West.	Eurimbla.	Wellington.	Tallewang.	Ulan.	Gulgong.	Condobolin.	Nelungaloo.
	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.
Sunset	14 55	...	...	...	...	...	...	...	...	...	...	...	...
Bunyip	15 39	...	...	...	...	24 0	...	...	...	...	...	...	...
Florence	15 27	...	...	23 36	32 28	23 37	28 46	...	...	...	...	20 23	26 57
Firbank	13 49	16 13	35 55	...	...	...	24 15	...	...	...	4 56	11 2	...
Canberra ...	15 18	27 43	41 3	30 26	33 18	29 25	33 0	20 13	...	24 11	17 17	24 13	...
Comeback ...	15 35	...	...	...	...	20 46	...	...	...	...	...	...	...
Improved Steinwedel.	17 49	...	40 27	18 56	...	29 42	35 49	...	31 10	16 51	6 49	18 11	29 38
King's Early ...	14 58	24 9	...	...	34 54	27 10	...	...	28 13	...	...	16 46	...
Hard Federation...	11 56	22 32	36 59	30 56	25 6	29 53	33 5	23 20	40 50	8 0	18 25	17 52	26 42
Warren	...	...	...	...	25 17	...	21 31	...	...	...	5 5	...	...
Bomen	...	...	...	...	26 21	25 40	35 36	...	...	17 16	21 34	...	27 32
Federation ...	16 52	22 21	35 8	22 33	36 8	30 22	32 36	26 15	46 4	15 5	19 35	27 5	...
Marshall's No. 3 ..	...	20 21	31 21	21 54	30 8	30 15	...	...	30 46	15 30	15 34	...	...
Yandilla King ...	...	21 16	...	...	30 19	32 18	...	...	39 27	10 22	22 9	...	...
Rymer	...	20 52	40 58	23 11	...	26 48	38 4	21 36	...	13 17	14 23	...	...
Warden	...	...	...	25 8	...	...	...	...	21 16	...	...	...	22 27
Zealand	...	...	...	...	15 17	...	...	...	...	...	...	...	...
Genoa	...	...	33 18	...	...	...	...	...	...	...	...	...	...
Major	...	22 7	35 12	...	23 5	32 10	36 53	25 41	47 10	...	...	...	29 7
Penny ... ..,	14 54	...	...	...	...	...	...	...	...	...	...	...	...
Roseworthy ...	...	...	...	...	...	...	...	23 29	...	...	...	...	31 9
Cowra No. 15 ...	...	...	...	...	...	...	...	...	...	...	...	...	35 10
Cowra No. 19 ...	...	...	...	...	...	...	...	...	...	...	...	...	30 0
Currawa	...	...	38 45	...	...	...	...	...	...	...	...	...	15 20
Cleveland ...	...	...	33 52	...	...	...	...	...	40 4	22 12	15 48	...	...
Marquis	...	...	...	...	...	...	...	23 12	...	...	21 45	...	...
Red Wings ...	...	...	...	...	...	...	...	17 41	...	...	...	...	...
Billy Hughes ...	...	...	...	...	...	...	...	13 5	...	...	...	...	...

NOTES.—The Ulan plots suffered from the attacks of black magpies, which in flocks of 200 to 300 pulled up the germinating grain; later, wallabies from the hills interfered with the growth to some extent.

On the Gulgong Experiment Area, Black Oats were so plentiful as to affect the yields to a considerable extent; compare with Tallewang results obtained 20 miles distant, both areas sown within a few days of one another.

Notes on Varieties.

The following notes show the qualities of the varieties under test :—

Sunset.—The earliest wheat, with a great tendency to lodge owing to its extreme weakness of stem; is only suited for the far Western areas.

Bunyip.—A little later than Sunset, but also possesses weak straw and liability to lodge. The grain is of low milling value.

Florence.—A good dual-purpose early variety, rust-resistant and fairly strong in the straw, though inclined to shell.

Firbank.—The best hay variety in the early wheats; also gives a fair quality grain.

Canberra.—This wheat has earned a well-deserved reputation amongst farmers in the Western District for its earliness, consistency and good yields. The straw is weaker than is desirable, but at the same time is tough, and lends itself to harvesting operations when lodged or tangled by storms. The grain is of good milling quality. This wheat is a decided acquisition to the farming community. It originated by hybridisation of Federation wheat with a barley from Russia.

Comeback.—An early wheat of the strong white flour quality. It is not a favourite with farmers on account of its shy yielding qualities.

Improved Steinwedel.—Is supposed to be an improved strain, by selection, from Steinwedel. The object of improvement was to secure a strain that held its grain better and did not kink in the straw, which, by breaking off, was lost to the harvester. The strain selected, so far, has not shown any decided improvement in this direction, except perhaps that the kinking is not so noticeable.

King's Early is a wheat in great favour amongst South Australians. It is bearded, weak in the straw, and, so far, has not met with the approval of farmers in this district.

Hard Federation is a selection from Federation, and is one of the recent productions that is receiving considerable attention. It is from a week to ten days earlier than Federation, produces grain of high milling quality, and possesses the desirable drought-resistant qualities of ordinary Federation. The straw is longer and more succulent, and on this account more suitable for hay than the standard variety. It is faulty in that it seems more susceptible to flag smut.

Warren appears to have a constitutional weakness that must be eradicated before it takes a place with better-known varieties.

Bomen is a variety of promise which has proved itself for a number of years in the Parkes district, both for hay and grain.

Federation gave consistent yields in every plot, returning the fine yield of 46 bushels to the acre at Tallewang, the second highest yield for all plots, only being exceeded by Major in the same locality, which yielded 47 bus. 10 lb. per acre.

Marshall's No. 3 gave fairly uniform results. . This is recommended to farmers as the best purple-straw wheat to grow.

Yandilla King is a wheat that favours certain localities more than others. It yields good hay and grain.

Rymer has a weakness of straw that prevents it becoming more of a favourite with farmers. It is a good dual-purpose wheat, but for this objection.

Warden is mainly a hay wheat, producing hay of excellent colour, weighty and palatable. It is very rust-liable, but should be given attention by hay growers.

Zealand, another hay wheat, is more rust-resistant than Warden, of which it is a rival in the production of good quality hay.

Genoa was only tried at Gilgandra. It appears to be too late for the Western District.

Major, of Victorian origin, headed the yields of all wheats tried, with a return of 47 bus. 10 lb. per acre at Tallewang. It has good strong straw, stands up well, and is assured of a place amongst the leading varieties in cultivation.

Penny.—A mid-season Victorian wheat, which was only tried at Nymagee and Dubbo. At the latter place a severe hailstorm destroyed the plots, and Penny survived the visitation best. Less grain was knocked out, and the whole crop suffered less than the other wheats, apparently on account of the strong upright growth of the stems. At Nymagee, in comparison with other varieties, good results were obtained. This variety should be given further trials.

Roseworthy is a South Australian production from Roseworthy College. It was only tried at Wellington and Nelungaloo, where good yields were obtained. Further trials should be made.

Cowra No. 15 and *Cowra No.* 19 are two new crossbreds produced at Cowra Farm. These wheats were tried mainly to see how they stood field conditions. The results are very promising, the wheats attracting the attention of the leading farmers in the locality in which they were grown, viz., Nelungaloo, near Parkes.

Currawa, a Victorian wheat, has given satisfactory yields, but has an objectionable characteristic in that during the past two seasons the grain has shown a black spot over the germ, rendering it disliked by millers, though the flour does not show any results from this discoloration. Until this objectionable feature is got rid of, this variety is not likely to be grown to any extent.

Cleveland is well known as being the most suitable wheat for the Tablelands for both hay and grain. It has given good results at Gilgandra for a number of seasons, Gilgandra not generally being considered a locality suited to its lateness in maturity.

Marquis, an importation from Canada, has been under discussion by the farming community for some time, but where tried in comparison with other varieties it has not produced results to merit growers to adopt it to any extent. At Gulgong different period sowings were made. Sown on 15th May, 1917, a yield of 21 bus. 45 lb. was obtained. From a sowing made on 31st July, 1917, no results were obtainable, the crop not being sufficient to harvest.

Red Wings and *Billy Hughes* are selections from Canberra, made by Mr. D. A. Rich, of "Roselayne," Wellington, in conjunction with Inspector Birks, B.Sc. Both selections are earlier than Canberra, which itself is an early maturing variety. The stooling qualities are excellent, in many plants from twenty-two to twenty-four stems being counted—a large number of stools in an early variety which usually stools sparsely. During the absence of the owner, pigs damaged these varieties considerably. Being the most forward wheats, the pigs were attracted to them and caused a big loss before the owner returned. The other wheats under trial were not sufficiently forward to attract the attention of the animals, and were not interfered with.

TABLE III.—Showing Yields of Hay in Wheat Variety Trials, Western District, 1917–18.

Locality and Date Sown.	Variety.	Quantity per acre		Yield per acre.			
		Seed.	Superphosphate.				
		lb.	lb.	t.	c.	q.	lb.
Carcoar	Warren	65	56	2	10	0	11
(sown 21st May, 1917.)	Warden	,,	,,	3	9	3	10
	Marshall's No. 3 ...	,,	,,	2	17	2	4
	Cleveland	,,	,,	2	14	3	18
	Yandilla King ...	,,	,,	2	2	0	7
	Zealand	,,	,,	2	6	3	19
Orange	Cleveland	62	Nil.	2	17	1	22
(sown 30th April, 1917.)	,, ...	,,	42	3	9	3	18
	,, ...	,,	56	3	10	3	24
	,, ...	,,	70	3	6	0	2
	Marshall's No. 3 ...	,,	56	3	4	2	0
	Warden	,,	,,	2	19	3	5
	Zealand	,,	,,	3	5	3	6
	Huguenot	,,	,,	2	15	0	22

Trials with Oats.

Algerian is widely known as one of the best all-round varieties. Complaints have been made against this variety in the far Western areas that, where it has been hurried to maturity by hot weather, it develops a bitterness and becomes unpalatable to stock. This same feature is noticeable in Tartarian oats, and in such cases an early oat such as Sunrise should be grown. Where grown, Algerian produced the highest yields of grain, but this was probably due to the late season experienced. Sunrise exceeded Algerian in hay yield.

Guyra, an Algerian-White Ligowo crossbred, is a most promising variety. It seeds well, producing a nice plump grain that may prove suitable to the oatmeal manufacturers, who at present import the plumper Victorian grown oat, usually Algerian. Guyra has not the length of straw of Algerian, but makes good hay.

Lachlan, another Algerian-White Ligowo cross, is intermediate in length of straw between Guyra and Algerian. Is earlier than Guyra. The same notes as for Guyra apply to this variety, apart from the differences mentioned.

Sunrise.—A selection from Algerian; is the earliest oat we have. At Nymagee it shed its grain very freely when ripening. Before harvesting a rainstorm occurred, and the ground was almost covered with the grain which had been shed. This feature was not pronounced when grown elsewhere. It is a good hay oat with white seed, and is assured of a good future.

Brown Calcutta is too weak in the straw to receive much consideration from the farming community. At Orange it lodged extensively, being the only variety to lodge.

Potato oat produces plump white grain, but owing to its readiness to take flying smut is not so well liked as Algerian.

TABLE IV.—Showing Yields of Hay and Grain in Oat Variety Trials, Western District, 1917-18.

Locality and Date Sown.	Variety.	Quantity per acre.		Yields per acre.					
		Seed.	Superphosphate.	Hay.				Grain.	
		lb.	lb.	t.	c.	q.	lb.	bus.	lb.
Grenfell ... ... (sown 29–30 May, 1917.)	Guyra	55	42					32	7
	Lachlan ...	,,	,,	....				28	24
	Sunrise	,,	,,	....				29	30
Nymagee ... ... (sown 25–26 May, 1917.)	Lachlan ...	44	22	....				21	6
	Sunrise	,,	,,	....				10	3
	Algerian... ...	,,	,,	....				24	37
Orange ... ... (sown 30 April, 1917.)	Algerian... ...	60	56	3	8	3	16	......	
	Guyra	,,	,,	3	13	2	7	......	
	Lachlan ...	,,	,,	3	4	1	17	......	
	Potato	,,	,,	4	8	3	26	......	
	Brown Calcutta	,,	,,	3	7	0	13	......	
	Abundance ...	,,	,,	3	16	3	25	......	
Carcoar ... ... (sown 30 May, 1917.)	Algerian... ...	80	56	2	7	1	5	......	
	Brown Culcutta	,,	,,	2	13	0	11	......	
	Guyra	,,	,,	2	8	3	26	......	
	Ruakura ...	,,	,,	2	16	3	25	......	
	Sunrise	,,	,,	2	14	2	24	......	
Alectown West ... (sown 15 June, 1917.)	Sunrise	60	42	2	9	2	6	......	
	Algerian... ...	,,	,,	2	0	2	17	......	
Condobolin ... ... (sown 28–29 June, 1917.)	Algerian... ...	60	28	....				29	23
	Lachlan ...	,,	,,	....				22	11
	Sunrise	,,	,,	....				19	38

Manurial Experiments.

The results from these trials, in conjunction with previous experiments conducted with superphosphate in varying quantities, compared with similar plots without any fertiliser, favour the use of that manure. The differences in yield were greatest in the Wellington, Eurimbla and Grenfell districts. The manured plots made more vigorous growth than the unmanured areas, but differences in growth at maturity were not very marked. At Parkes the manured plots lodged badly, and had to be harvested *en bloc*. The unmanured plots were a little later in maturing. The growing season was much longer than usual, harvesting generally being late, due to the frequent rainfall during the growing period. The effects of the application of superphosphate were the same in this season of plentiful rainfall as were noted for last year, viz., that the unmanured plots made equally good growth, but were later in maturity and yielded less; also that the increased growth due to superphosphate made the crop more liable to lodge in heavy weather.

TABLE V.—Showing Results of Manuring Wheat for Grain, Western District, 1917–18.

Locality.	Variety.	Date Sown.	Seed per acre.	No manure.	Superphosphate per acre.			
					28 lb.	42 lb.	56 lb.	70 lb.
		1917.	lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Grenfell ...	Federation ...	29–30 May	55	17 45	22 13	22 21	21 7	......
Gilgandra ...	Canberra	22–23 ,,	62	38 9	41 3	39 4	37 13	......
Parkes ...	Warren	25–26 June	60	22 48	averaged	18 48	—lodged.	......
Coradgery. ...	Hard Federation ...	4–5 ,, ...	57	21 23	21 57	23 7	25 6	......
Eurimbla ...	Canberra	8–9 ,, ...	85	30 33	32 52	36 36	33 0	......
Wellington ...	Hard Federation ...	4 May ...	60	10 6	......	20 42	23 20	19 ·52

Crop Harrowing Tests.

The weather conditions were responsible for making these tests of little value. At Alectown West, Wellington, and Eurimbla results favoured the use of the harrow on the growing crop, while at Gilgandra the results were variable. With such a favourable season for growth, the objects aimed at, viz., retention of a mulch and of soil moisture, were nullified, as the rainfall was ample for all crop requirements.

TABLE VI.—Showing Results of Crop Harrowing Tests, Western District, 1917–18.

Locality.	Variety.	Date Sown.	Seed per acre.	Yield per acre.	
				Harrowed.	Unharrowed.
		1917.	lb.	bus. lb.	bus. lb.
Gilgandra	Canberra	22–23 May ...	62	41 3	38 9
,, ...	Hard Federation ...	22–23 ,, ...	,,	36 59	37 28
,, ...	Marshall's No. 3 ...	22–23 ,, ...	,,	31 51	31 32
Eurimbla	Hard Federation ...	8–9 June ...	85	33 5	34 35
Wellington	,, ...	4 May ...	60	17 53	23 20
Alectown West ...	Canberra	2–4 June ...	70	29 25	33 37

Fallowing Tests.

As the value of fallow lies mainly in the conservation of moisture in the soil, the results of this experiment were nullified. The season was of sufficient rainfall to produce good crops under almost any treatment.

TABLE VII.—Showing Results of Fallowing Tests, Western District, 1917–18.

Locality.	Variety.	Date Sown.	Seed per acre.	Yield per acre.			
				Unfallowed.		Fallowed.	
				Worked.	Unworked.	Worked.	Unworked.
		1917.	lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Gilgandra ...	Marshall's No. 3..	22–23 May	62	31 51	31 32	29 33	31 21
Alectown West	Canberra ...	2–5 June	70	......	....	24 6	29 25
			bus.			t. c. q. lb.	t. c. q. lb.
,, ...	Sunrise Oats ...	2–5 ,,	1¾	......	....	2 5 3 0	2 9 2 6

Acclimatised *versus* Introduced Seed.

This test was held for the purpose of comparing the cropping values of seed introduced from a different locality to that which had been grown in the district for some years and acclimatised. As the same treatment of the grain was not possible under the circumstances, the results to be deduced are not definite. The introduced seed was pickled in bluestone and limewater by the Department, and the local seed was bluestoned only, and it is quite possible that this treatment interfered with the germination. It is likely that as most farmers do not pay much attention to keeping up the stamina of their wheats, as do the Departmental farms, the inferiority of locally-grown seed is due to this lack of improvement by selection on their part. Throughout the Western District it was specially noticeable that the same varieties of wheats sown by the farmer experimenter at practically the same time, and under much the same conditions as the Experiment Plots were sown, did not make the same headway in growth and gave lower yields than similar varieties in the plots.

TABLE VIII.—Showing Results of a Test at Eurimbla with Acclimatised *versus* Introduced (Unacclimatised) Seed, Western District, 1917–18.

Variety.	Date Sown.	Seed per acre.	Super-phosphate per acre.	Yield per acre.	
				Acclimatised.	Introduced.
		lb.	lb.	bus. lb.	bus. lb.
Federation	8–9 June, 1917...	85	56	29 50	32 36

"Rate of Seeding" Test.

The weather conditions were likewise responsible for unsatisfactory results in this test, as the normal local conditions did not prevail. At Nymagee and Condobolin light seedings usually give best returns; but the lengthened period of growth and frequent rainfall favoured the heavier seedings, except in the case of the 65 lb. seed per acre plot at Condobolin, which lodged, evidently on account of fineness of straw. In the only other district where this test was carried out, the differences in yield were not sufficiently marked to justify any deductions concerning the amount of seed per acre most satisfactory to apply.

TABLE IX.—Showing Results of "Rate of Seeding" Tests, Western District, 1917–18.

Locality.	Variety.	Date Sown.	Light Seeding.		Medium Seeding.		Heavy Seeding.	
			Seed per acre.	Yield per acre.	Seed per acre.	Yield. per acre.	Seed per acre.	Yield per acre.
		1917.	lb.	bus. lb.	lb.	bus. lb.	lb.	bus. lb.
Nymagee ...	Florence ...	25–26 May	25	12 46	35	13 59	45	15 27
Tallewang ...	Yandilla King ...	9–10 ,,	50	39 27	60	38 59	70	39 23
Condobolin ...	Florence ...	28–29 June	45	20 23	55	28 11	65	16 40

Threshing *versus* Stripping.

This experiment was carried out at Coradgery, and the results are in favour of threshing. In the case of Yandilla King, owing to pressure of work, the plot was cut before it had arrived at the proper reaping stage, and the lower yield is on this account.

TABLE X.—Showing Results of Threshing *versus* Stripping Test, at Coradgery, Western District, 1917–18.

Variety.	Date Sown.	Seed per acre.	Superphosphate per acre.	Yields per acre. Threshed.		Yields per acre. Stripped.	
	1917.	lb.	lb.	bus.	lb.	bus.	lb.
Yandilla King ...	4 and 5 June ...	57	55	*29	25	30	19
Hard Federation ...	,, ...	,,	,,	30	31	25	6
Florence	,, ...	,,	,,	34	39	32	28

* Cut on green side.

POTASH SALTS IN THE UNITED STATES OF AMERICA.

THE United States has suffered, in common with other parts of the world, from a shortage of potash for manurial and other purposes, but it has made remarkable efforts to supply the deficiency from its own resources. The production during 1917 totalled the very favourable amount of 32,366 tons of available K_2O, which was approximately three and one-third times that turned out in the United States for the previous year, while it was about one-eighth of the amount imported during a normal year prior to the war.

From mineral sources production was divided into four groups—from natural brines, from alunite, from dust from cement mills, and from dust from blast furnaces. Of these four, by far the largest production was from natural brines, the amount being 20,652 tons of available K_2O, having at point of shipment a value of about £1,644,000. From alunite (including salts and crude and roasted alunite) there were three producers, having a total production of 7,153 tons of potash (2,402 tons available K_2O), and having a total value at shipping point of about £190,000. From cement mills 13,582 tons of potash (1,621 tons available K_2O) were produced, the value being £140,000; while the potash from blast furnaces totalled 2,133 tons (184 tons available K_2O), and valued at £14,000.

The production from organic sources may be summarised as follows:—

Source of Potash.	Amount of Potash.	Available K_2O.	Approximate Value at Shipping Point.
	tons.	tons.	£
1. Kelp	11,306	3,572	423,000
2. Molasses, residue from distilleries ...	8,589	2,846	226,000
3. Wood ashes	700	424	81,000
4. Waste from sugar refineries	2,593	359	28,600
5. Evaporated wool washes and miscellaneous industrial wastes	645	305	22,600

Farmers' Experiment Plots.

SOUTHERN DISTRICT.

H. C. STENING, Inspector of Agriculture.

SUMMER FODDER EXPERIMENTS, 1917-18.

Experiments with summer fodder crops were conducted on the farm of Messrs. H M. Hall and Sons, Studbrook, Cunningham, near Harden.

In addition to different varieties of maize, and of saccharine and non-saccharine sorghums, a test was made with Black cowpeas, Japanese millet, and Sudan grass.

The soil was a black alluvial loam, situated on a creek flat, which had been in cultivation for a considerable number of years. The land was ploughed 8 inches deep on 12th July, 1917, skim-ploughed on 10th October, and harrowed prior to sowing on 25th October. The seed was sown in drills 35 inches apart with a 14-disc wheat drill, feeding through three tubes only. The quantities of seed sown per acre were—maize, 25 lb.; sorghum, 7 lb.; cowpeas, 12 lb.; Japanese millet and Sudan grass, 5 lb. Superphosphate was applied at the rate of 1 cwt. per acre through all tubes of the drill. The growing crops were intertilled twice.

As each crop was harvested when it matured, the dates of harvesting varied according to the length of the growing season of the varieties.

The following are the yields per acre, together with the dates of harvesting of each crop:—

	Yield per acre.		Date of Harvesting.
	tons	cwt.	1918.
Maize—			
Boone County White	10	10	20 February.
Leaming	10	5	20 ,,
Improved Yellow Dent	10	0	4 March.
Hickory King	8	15	2 ,,
Funk's Yellow Dent	8	12	2 ,,
Saccharine Sorghums—			
Early Amber Cane	14	4	20 ,,
Planter's Friend...	11	3	20 ,,
Sorghum Saccharatum	7	3	26 February.
Non-Saccharine Sorghums—			
White Kafir Corn	15	4	20 March.
Milo	7	13	26 February.
Feterita	6	2	4 March.
Manchu Kaoliang	5	7	26 February.
Black Cowpeas	7	3	16 ,,
Japanese Millet	3	2	13 ,,
Sudan Grass	2	14	16 ,,

An additional plot of both Sudan grass and Japanese millet was sown, the seed being broadcasted at the rate of 14 lb. per acre. The seed was mixed with the superphosphate, and sown through the manure-box of the wheat drill. In this test the Sudan grass outyielded the Japanese millet, the results being as follows:—

	tons	cwt.	
Sudan grass ...	4	0	per acre.
Japanese millet ...	3	0	,,

Manure Test.

In order to note the influence of manure on the yield of fodder, one plot of Improved Yellow Dent maize was sown without manure, for comparison with the plot of this variety manured with 1 cwt. superphosphate per acre, and resulted as follows:—

	tons	cwt.
Improved Yellow Dent, manured 1 cwt. superphosphate per acre	10	0
,, ,, unmanured	9	12

It was the intention to allow the non-saccharine sorghums to mature the grain, and to record the yields of grain, but unfortunately stock broke in and damaged the crops before the grain was ripe.

MAIZE EXPERIMENTS, 1917–18.

Maize experiments for grain were conducted on the farms of Mr. A. Davis, "Woodlands," Gilmore, and Mr. A. N. Stacy, "Camelot," Tumut, during the past season.

The Tumut Plots.

Owing to the flooded condition of the river flats, it was necessary to select a higher site on land that locally is not considered to be very suitable for maize-growing, except in very favourable seasons. The soil was a black alluvial clay loam, which had been in cultivation for over forty years. Even at this level the land had been flooded, and was so waterlogged that it was not possible to prepare the land in time for a seasonable sowing. The land was ploughed 6½ inches deep on 19th November, harrowed, rolled three times, cultivated with spring-tooth cultivator, and rolled again. The sowing was made on 26th November with a one-row maize planter, dropping three grains 3 feet apart, in rows 3 feet 9 inches apart. It could not be expected that the best results would be obtained from such a late sowing on land other than river flats, and it was very fortunate that there were no early frosts to damage the crops before they had matured.

The growing crops were harrowed on the 3rd and 12th December, and were scarified on 28th December and 3rd and 15th January.

The Gilmore Plots.

The river flats at Gilmore were also flooded, and the site selected for the experiments was on high land of slate derivation, which cannot be regarded as a maize soil, and was selected more particularly to note the influence of

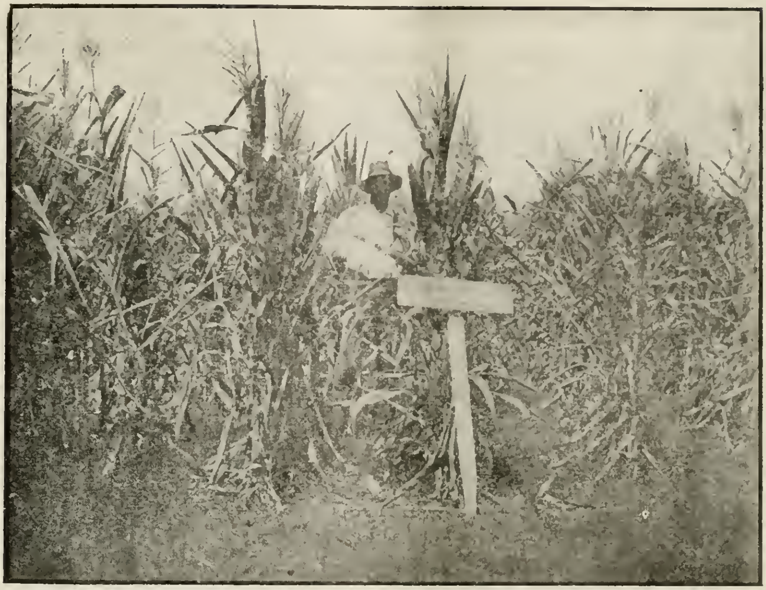


Fig. 1. Improved Yellow Dent Maize at Cunningham. Yield of green fodder, 10 tons per acre.

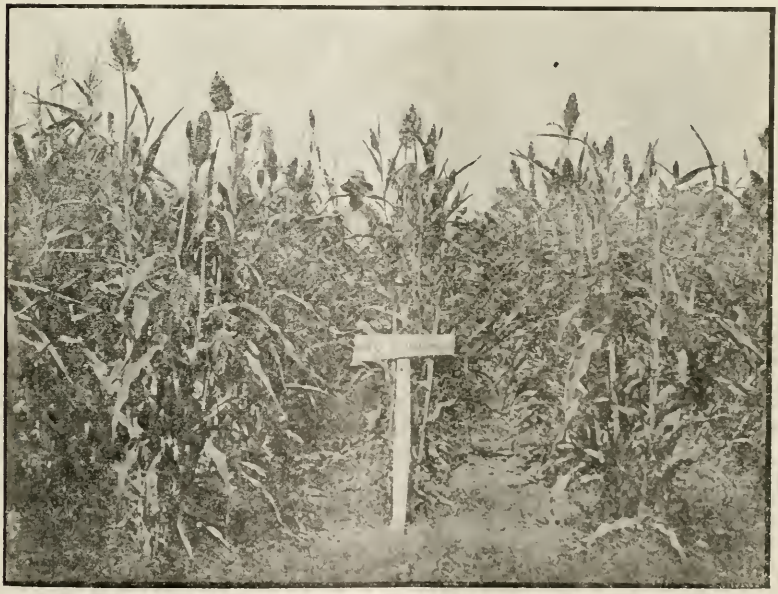


Fig. 2.—Milo Sorghum at Cunningham. Yield of green fodder, 7 tons 13 cwt. per acre.

Summer Fodders. Farmers' Experiment Plots, 1917–18.

fertilisers on such soils. It was a red loam, which had been in cultivation for forty years. The land was ploughed 6 inches deep, harrowed and cross-harrowed during the second week in September, and disced second week in October. Wet weather compelled a postponement of the sowing, which was completed on 23rd October. The seed was sown with a one-row maize-planter with fertiliser attachment, dropping three grains every 3 feet, in rows 3 feet 10 inches apart. Heavy rains continued to fall subsequent to sowing, which caused the soil to wash out badly and to set down hard, and in consequence the yields were prejudicially affected.

TABLE A.—Showing Rainfall during growing period, Maize Experiments, Southern District, 1917–18.

Month.	Tumut.	Gilmore.	Month.	Tumut.	Gilmore.
1917.	points.	points.	1918.	points	points.
October	...	108	January	252	273
November ...	...	485	February ...	155	243
December ..	182	213	March	216	270

Total—Tumut, 805 points; Gilmore, 1,692 points.

The experiments comprised a variety trial and fertiliser test at each locality. The results of the variety trials are shown in Table B.

TABLE B.—Showing Results of Maize Variety Trials, Southern District, 1917–18.

Variety.	Tumut.		Gilmore.	
	bus.	lb.	bus.	lb.
Leaming	43	16	19	38
Craig-Mitchell	42	17	18	4
Early Yellow Dent ...	39	36	16	20
Reid's Yellow Dent ...	41	53	12	8
Silvermine	33	39	18	12
Funk's Yellow Dent ...	35	43	15	30
Gold Standard Leaming ...	37	6	14	8
Prairie Queen	35	24	14	44
Boone County White ...	31	39	18	4
Early Clarence	31	1	13	14
Potchefstrom Pearl ...	38	12	......	
Chester County	......		16	20

Each plot received 1 cwt. superphosphate per acre.

Considering the fact that the land has been practically worked out, having been under cultivation for over forty years, and also the very late sowing, the yields obtained at Tumut are very satisfactory. The yields at Gilmore were very low, which may be attributed to the unsuitability of the soil for maize, and to the soil having set hard as the result of the heavy rains in November, as indicated in Table A.

Details of Varieties.

Leaming was top yielder at both centres, supporting the results obtained in previous years. It matured later than any of the other varieties, and therefore would doubtless have given even better yields with an earlier

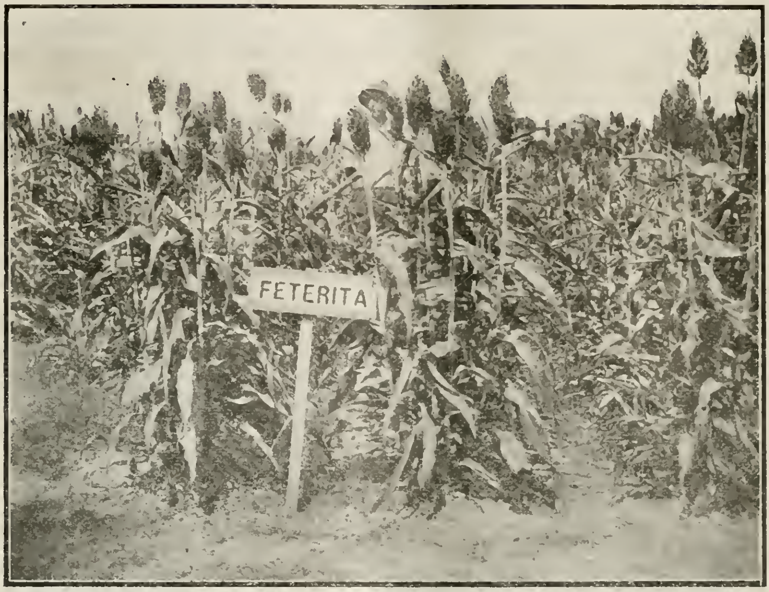


Fig. 3.—Feterita (Non-saccharine Sorghum) at Cunningham. Yield of green fodder, 6 tons 1 cwt. per acre.

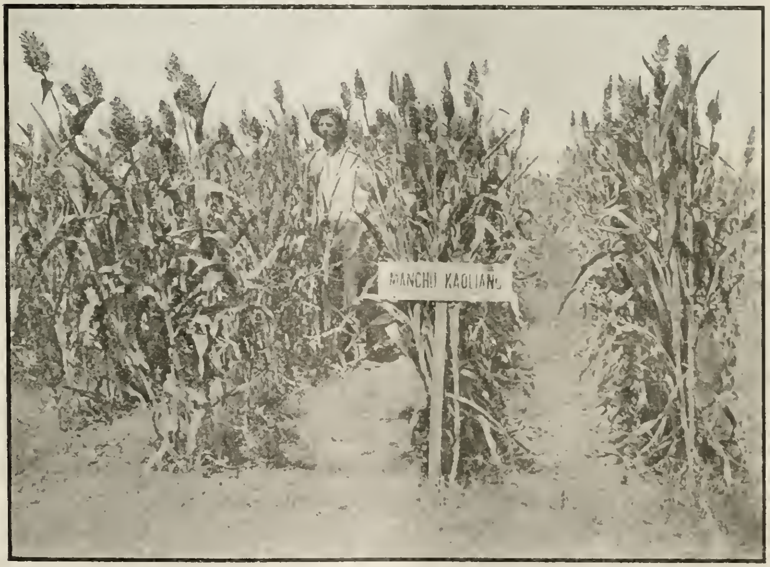


Fig. 4.—Manchu Kaoliang (Non-saccharine Sorghum) at Cunningham. Yield of green fodder, 6 tons 1 cwt. per acre.

SUMMER FODDERS. FARMERS' EXPERIMENT PLOTS, 1917-18.

sowing. Some growers raise an objection to this variety on account of the small size of the cobs, as they require more handling in harvesting and threshing than large cobs. It produces a small attractive grain, which weighs well.

Craig-Mitchell, which was tested for the first time on the Experiment Plots, has returned the second highest average yield. It is a white maize, which matures fairly early.

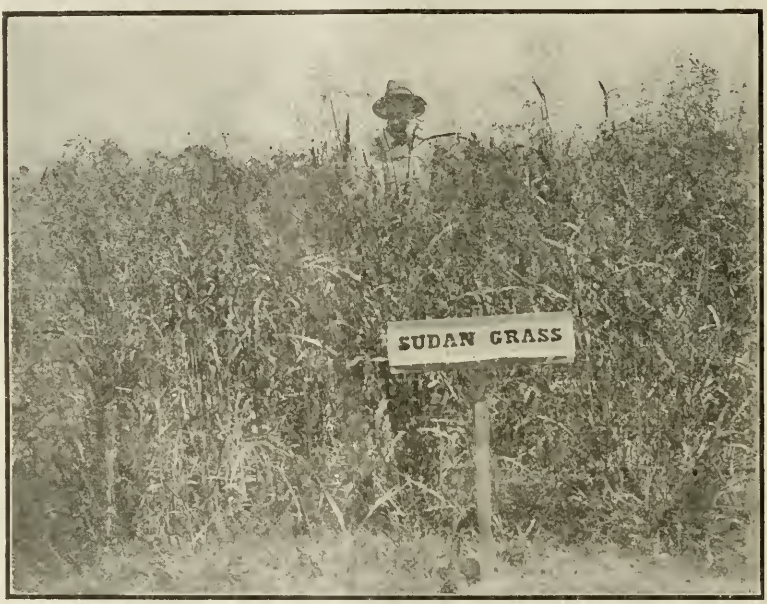


Fig. 5.—Sudan Grass at Cunningham. Yield of green fodder, 4 tons per acre.

The early varieties, *Early Yellow Dent, Reid's Yellow Dent,* and *Silvermine* have yielded satisfactorily; while the mid-season varieties, *Funk's Yellow Dent, Gold Standard Leaming,* and *Boone County White,* have not been as prolific as usual. Without doubt the late sowing has favoured the earlier maturers.

Prairie Queen is a large-cobbed variety, somewhat resembling *Early Clarence,* although it matures a little later. Both these varieties would show to much better advantage on river flat soils. Early Clarence is not favoured by some growers, owing to the prickly nature of the cobs, which causes the hands to become sore unless gloves are worn when harvesting.

Potchefstrom Pearl and *Chester County* are varieties tested for the first time; both are fairly late maturers. The former is a white maize, with very large grain, being a cross between Hickory King and Boone County White, and is rather promising as a yielder. Chester County is a yellow maize, which possesses no qualities to recommend it in preference to other proved varieties.

Manurial Experiments.

Fertiliser tests, consisting of five plots, were carried out in each locality, Funk's Yellow Dent being the variety used for this purpose. In both instances the fertilisers were applied by means of an attachment to the maize planter. One plot was unmanured, and the remaining plots received application of fertilisers as follows:—

	s.	d.
1 cwt. superphosphate per acre, valued at... ...	4	10
2 ,, ,, ,, ,, ...	9	9
2 cwt. P7 mixture, consisting of 1 cwt. superphosphate and 1 cwt. bone-dust per acre, valued at	15	0
1½ cwt. M5 mixture, consisting of 1 cwt. superphosphate and ½ cwt. sulphate of ammonia per acre, valued at	17	10

Table C.—Showing Results of Manurial Experiments, Southern District, 1917–18.

Manure per acre.	Tumut.				Gilmore.			
	Yield per acre.		Increase due to manure.		Yield per acre.		Increase due to manure.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
No Manure...	32	23	......		8	44	......	
1 cwt. Superphosphate	35	43	3	20	15	30	6	44
2 ,, ,, ...	38	44	6	21	15	0	6	14
2 cwt. P7 Mixture	35	42	3	19	16	28	7	42
1½ cwt. M5 ,, ...	39	21	6	56	19	30	10	44

In every instance substantial increases have been returned as the result of manuring. These increases are set out more clearly in Table C, where it will be seen that the soil at Gilmore has responded to manuring in a most remarkable manner, 1 cwt. of superphosphate per acre returning a 77 per cent. increase, and 1½ cwt. M5 mixture per acre, 122 per cent. increase over the yield of the unmanured plot.

The highest yields at both centres were returned as the result of the application of 1½ cwt. M5 mixture per acre, but this is a comparatively expensive fertiliser; and when prices are taken into account the highest net profit was obtained at Tumut by an application of 2 cwt. superphosphate. However, at Gilmore the M5 mixture easily returned the highest net profit per acre, viz., £1 15s. 11d.

Table D.—Showing Value of Increase per acre and Profit due to manuring, Maize valued at 5s. per bushel, Southern District, 1917–18.

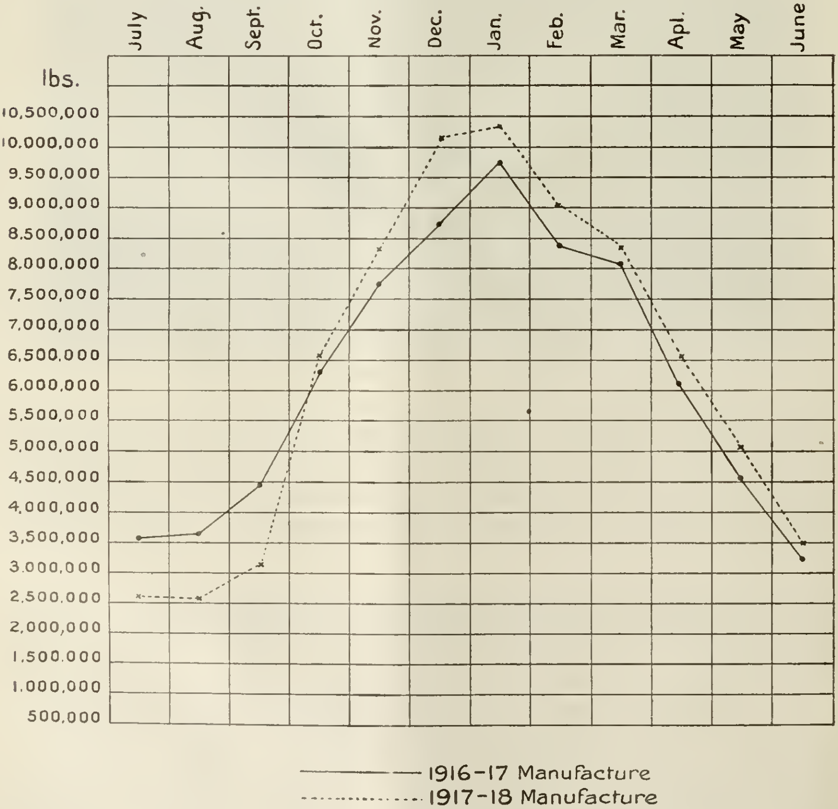
Manure per acre.	Tumut.		Gilmore.	
	Value of Increase.	Profit due to manure.	Value of Increase.	Profit due to manure.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1 cwt. Superphosphate	0 16 8	0 11 10	1 13 9	1 8 11
2 ,, ,, ...	1 11 9	1 2 0	1 11 2	1 1 5
2 cwt. P7 Mixture	0 16 7	0 1 7	1 18 7	1 3 7
1½ cwt. M5 ,, ...	1 14 9	0 16 11	2 13 9	1 15 11

QUALITY AND QUANTITY OF NEW SOUTH WALES BUTTER, 1916-18, SHOWN GRAPHICALLY.

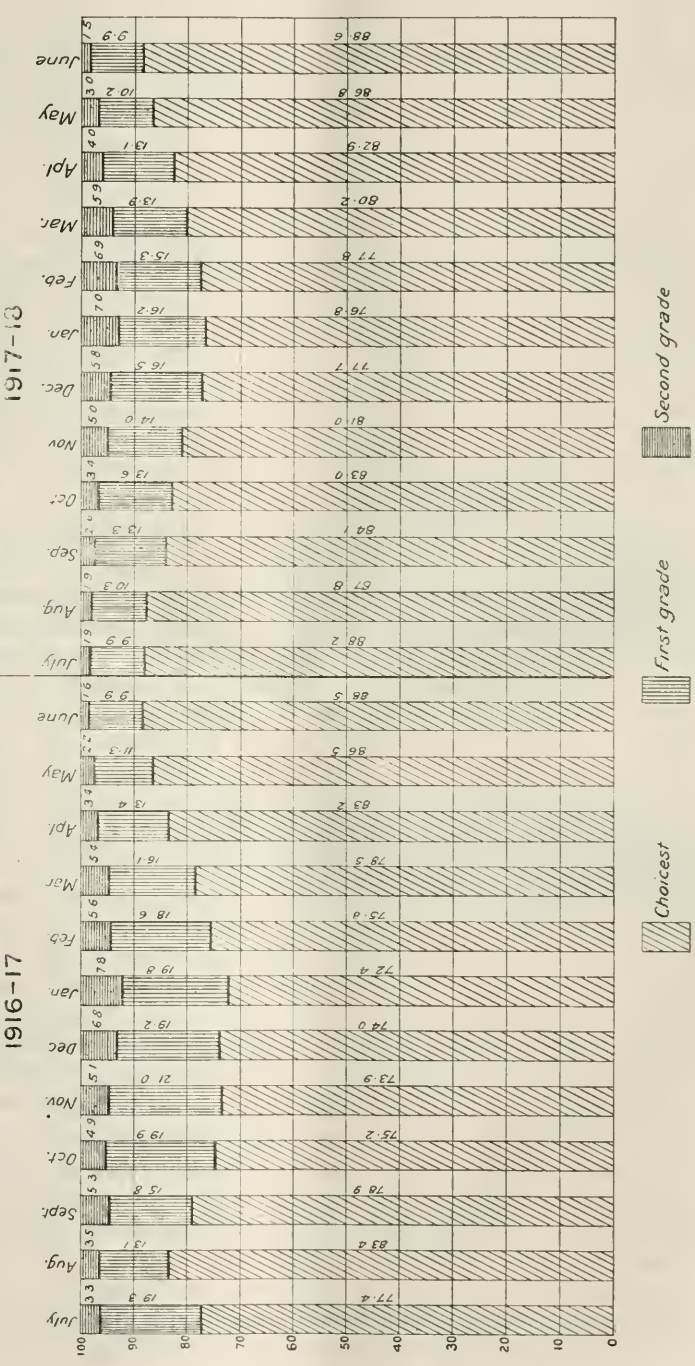
In the September issue a statement was published showing the monthly returns from the butter factories for the years ending 30th June, 1917 and 1918 respectively. The figures also indicated the quality of the butter as graded in accordance with the Dairy Industry Act.

The following diagrams indicate graphically the quantity and quality of each month's output, and also the marked improvement (amounting to 3·6 per cent.) in the total of the choicest grade of the 1917–18 product over that of the previous year.

Graph I.—Showing Monthly Output of Butter in New South Wales for the years 1916–17 and 1917–18.



GRAPH II.—Showing Quality of New South Wales Butter, month by month, for the years 1916–17 and 1917–18 as graded under the Dairy Industry Act.



A Serious Pest to Stored Wheat.

THE LESSER GRAIN-BORER (*Rhizopertha dominca*).

W. W. FROGGATT, F.L.S., Government Entomologist.

AMONG the number of different kinds of insects found in or about the great wheat stacks. that have been piling up during the last three years in this State, there are many that only come to feed upon the waste or damaged wheat, or at most to gnaw the surface of the grains. These insects, through their presence in the bags of wheat in both the larval and perfect states, do a certain amount of damage ; but it is the primary destroyers which eat to the heart of the grain that cause such enormous destruction of wheat all over the world. The first two of these are the cosmopolitan grain weevils, both of which attack the stored grain in the same manner, and to all intents and purposes the damage they cause is practically the same.

Calandra oryzœ is the common species all over New South Wales ; it has a well-developed pair of hind wings folded up beneath the protective wing covers ; it can fly, though it only uses these wings under exceptional circumstances. It is usually smaller and darker in colour than *Calandra granaria.* The latter, commonly known as the granary weevil, is rare in this State, but is the common species all over Victoria and South Australia. It is generally larger and of a lighter reddish brown than the previous weevil, and it is wingless.

We now have a third primary wheat pest that destroys stored grain in the same wholesale manner. It has been called by the American entomologists "The Lesser Grain-borer," and it was described by Fabricius in 1792 under the name of *Rhizopertha dominca*, from specimens said to have come from India. It is another cosmopolitan beetle, well known in India in stored grain, that has been recorded from many other parts of the world, where it has been probably carried and accidentally introduced with shipments of grain. In this way it has reached Australia, where it has probably been established in a minor degree for many years. It is recorded as a common pest in wheat stacks in South Australia, and some months ago the writer noticed a few in the wheat stacked in the grain sheds at Darling Harbour. During June a careful survey was made of last year's wheat stacked at Enfield, when numbers of these beetles were found both inside and outside the bags.

Previously, the writer had inspected a large number of wheat-stacks in the inland districts without finding any traces of this beetle ; so that it is probable that at the present time it is confined to the neighbourhood of Sydney.

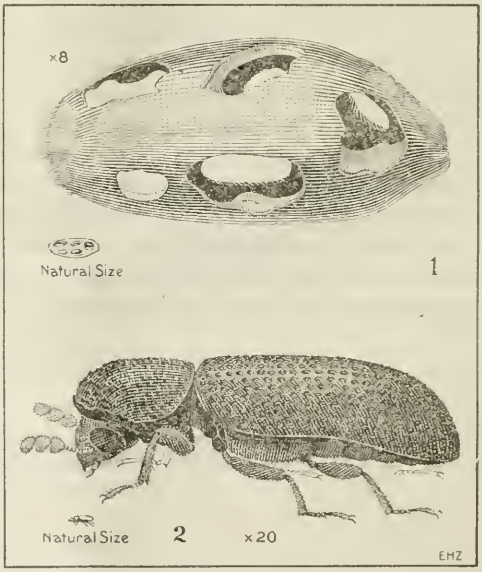
The Lesser Grain-borer belongs to the wood-boring beetles (family *Bostrychidæ*), which are very different from the members of the family *Curculonidæ*, snout beetles or weevils, to which the grain weevils belong.

The beetles of this family (*Bostrychidæ*) have the head turned down under the prothorax, and are armed with powerful jaws with which they can cut directly into the wood. On account of the clean-cut holes they bore into branches or dead timber, some are popularly known as "auger beetles," others as "shot-hole borers."

This species (*Rhizopertha dominca*) is often found in the wood of packing cases from the East; evidently it was originally a wood-boring beetle before it found the contents of the cases suitable as food, and adopted domestic habits. It has been obtained from stored drugs, various seeds, besides stored grain, roots, such as dried rhubarb, powdered arrowroot, and ships' biscuits.

Though sometimes found infesting rice it seems to prefer wheat. The adult beetles gnaw up the whole of the wheat grains from the outside until each is reduced to an absolute shell; then they crawl inside and feed upon the inner surface. The damage they cause can be easily distinguished from the more regular hole of the true weevils in each infested grain.

This beetle appears to be most noticeable in the coastal cities where merchandise from abroad is being constantly landed. In the United States, Chittendon thinks that it often dies out, even when introduced with goods and well established in inland towns. Though originally a tropical beetle, it now ranges over Europe, Egypt, Algeria, Hawaii, Madeira, and the United States, and is now recorded from Australia, but appears to thrive best in a warm climate. Therefore, this country may prove to be a very suitable home for this grain-borer if it ever becomes firmly established on our coast, and the danger of it being scattered inland with infested grain or old bags is a very serious matter.



1. **Grain of Wheat attacked by the Lesser Grain-borer.** Note how the grain is reduced to an absolute shell.

2. **The Lesser Grain-borer** (*Rhizopertha dominca*).

The Lesser Grain-borer can be easily distinguished, even with the naked eye, from the grain weevils, by its slender cylindrical form and small size, for it measures only about $\frac{1}{8}$ of an inch in length. The prothorax is rounded and covers the head, which is furnished with large eyes, powerful jaws, and slender ten-jointed antennae, the last three forming a pectinate club. The general colour varies from almost black to reddish brown.

It has been redescribed under a number of different names, several of which until lately have been looked upon as distinct species; *Rhizopertha pusillus* is now considered to be only a variety of this species. Chittendon, in the 96th Entomological Bulletin of the U.S. Department of Agriculture, 1911, gives an account of the synonomy and range of this beetle.

Unlike the grain weevils, the Lesser Grain-borer does not deposit her eggs in or upon the wheat grains, but drops them into the loose mass, and the growing larvæ do not even bore into them ; the damage is confined to the adult beetles. Experiments in the United States proved that in the summer months the life-history from the eggs deposited among the grain to the development of the adult beetle occupied about three months.

Mr. McCarthy, who made some careful observations upon specimens placed in jars in fresh wheat in the Entomological Laboratory, informs me that through the winter months the beetles remain quiescent and do not attempt to feed upon the grain. In the stacks, a warm sunny day even in midwinter seems to affect them, for, in company with the weevils, they were crawling about on the exposed surface of the bags in which they had been feeding late in June.

How to Prevent its Spread.

A considerable amount of wheat has been damaged by these beetles in the Enfield wheat-stacks, but if prompt action is taken it should be possible to prevent them from spreading beyond the coastal area.

The first thing to be done is to quarantine all empty bags, screens, and dunnage, and allow nothing to go into the country that has been in use at Darling Harbour or Enfield before they have been thoroughly disinfected. Any wheat, if sent from Enfield into the country, should be treated with hot air, as experiments have shown that it requires a heavy charge of either bisulphide of carbon or hydrocyanic acid gas to destroy the beetles in the wheat.

Increased Production of Cereals.

J. T. PRIDHAM, Plant Breeder.

In addition to rearing more stock to supply the needs of the country and for export, farmers the world over are being asked to grow more grain. This is especially the case in countries more directly affected by the war; but even in Australia, with a large prospective trade to America, there is great inducement for farmers to increase their efforts. Wheat is required for human consumption, oats for horses chiefly, while barley is being more largely grown for stock food, and finds a useful place in the farm rotation.

It may be asked, what more can be done apart from an increased acreage being put under crop? The man power of the agricultural districts has been weakened by the demands of war, and it is unreasonable to expect a very great addition to the extent of crop put in. The Department has for many years been experimenting with fertilisers, and is in a position to give growers definite and proved advice in this direction in order that the best returns may be secured from the land. While new varieties have a subtle attraction for the man on the land, they have to be regarded with suspicion, or at any rate with reserve, until their value is proved by trials at the Farmers' Experiment Plots or Experiment Farms. It may be we have not written the last word on methods of cultivation; but successful farmers have demonstrated their methods so repeatedly that we need not look for new ground to be broken in this direction in the immediate future. We may take it that agricultural implements are in a sufficiently advanced stage of perfection for the needs of our conditions of soil and climate, considering the competition existing among machinery firms. Where, then, are we to look for an avenue to increased production? More especially to the plant itself.

As soon as we approach this aspect of farming we come to a dead end. This path, however, only requires opening up to lead to what is perhaps the most promising field of all for the progressive man. We need to be educated in order that we may individualise the plant—to isolate the best from the mixed population of the paddock—in other words, selection in its truest sense. It is time that plant-breeding is divested of the cloak of scientific mystery that has enshrouded it for the lay mind. That there are depths unfathomed in this branch of science, no one knows better than the plant-breeder; but as cream lies on the surface, so the observant farmer can as well take advantage of desirable variations appearing in the crop as the trained scientist; and he has the advantage of being continually on the spot. As he passes to and fro with his team he is in the best position to detect a particularly fine head in the crop, and in thin patches of growth to isolate an unusually vigorous plant.

We have sheep studs in the State which command high prices for pedigreed rams, and yet we do not see any advertisements of stud Federation wheat, although the wheat-grower has an infinitely larger number of individuals to select from than the biggest stud sheep breeder—wider scope and better opportunities for selection if they were only availed of. We have poultry strains galore; but who ever bothers about raising a pedigree strain of oats? Provided the seed is free from black oats and smut, and not too pinched, it is worth the market price! And the market price for seed oats is very little more than for feed oats—in fact, often the same. But this hardly obtains with poultry. A guinea is cheerfully paid for a rooster; but no one would think of breeding for egg production from fowls bought at 5s. a pair in the market.

Let us take a walk to the nearest paddock and look narrowly at the plants comprising the crop. The close seeding largely prevents our singling out individuals, but we can soon see that some seeds have thrown up but one stalk; others, two, three, and more. The number of straws depends partly on the environment of the seed and partly on its initial vitality and breeding. It will be said, "Oh, it's just a matter of grading." This is partly true; grading is very important, for many seeds become damaged at stripping time, and many that are not injured have been weak and thin seeds, which could never produce healthy plants. Even a graded sample will not grow a completely uniform crop, because we may have two stalks springing from a fine, plump seed and three or four stalks from another equally fine, and with the same advantages of fertiliser and moisture. In the one case the individual is only moderately productive by nature, and in the other it is naturally a heavy yielder. If these principles of selection were not followed by seedsmen we should have our beans and peas deteriorating and our flowers smaller and less showy.

At the Government farms pedigreed seed of cereals is raised; but we should like to see private farmers devoting attention to this work, as they are doing in America, where we hear of Funk and Riley in the seed maize business and Wheeler breeding seed wheat, in spite of the fact that in that country the Government and State organisations are so large and complete that pedigreed seeds are mostly supplied from this source.

We should like to enlist the sympathy and interest of school teachers and boys in rural districts. If a teacher has twenty rows of wheat in his school garden, and Jim Smith's plot is the best, there is naturally more interest aroused over the garden than if the twenty plots were sown from a packet supplied by the nearest Government farm. The boys should be encouraged to pick out the best plants or ears from their fathers' crop, and if each boy has a plot, the whole series being given similar treatment in the way of cultivation, the chances are that the spirit of rivalry started among the boys will reach the homes, the result being a seed plot established in a corner of the house paddock or garden, or perhaps in the wheat paddock itself. If the grain from a single head, or preferably the stalks springing from one set of roots, be taken as the unit, in a surprisingly short time we may gather a stock of seed. The grains should be sown at first singly by hand a few inches apart, like peas, in a row. It is first necessary to prove that a plant is a good mother—that is, that the family arising from it is productive. To determine the prepotency of an individual, it is necessary to grow it at least for two seasons in plots alongside other mother plants taken from the same variety for comparison.

This is interesting work, and once started the farmer will no longer think of the trouble which may at first seem to be associated with it; and when he can see that it touches his pocket, that it is a payable proposition, the work becomes a pleasure. It must, of course, be maintained, as the old writer Virgil said: "Unless the farmer continues to pick out the most robust, the crop as a whole goes back to the old level of mediocrity."

What we have been insisting on is merely an application of Quetelets' law. This states that if 1,000 men be taken, and their heights recorded, there will be relatively a few very short, a few very tall, and the remainder of a medium height. We have in our minds to stand our plants against a wall to get a correct view of their productiveness and vigour. Place them in ascending order of yield, keep a few at the top of the line for seed, and the rest may be good enough for some farmers, but not for the progressive man.

Banana Culture in the Tweed District.

C. E. B. WELSH, F.R.H.S., Mirambeek Farm, Tweed Heads.

FOR many years sugar-cane has been the main crop grown in the Tweed district; but since black labour ceased to be available, sugar-cane growing has gradually declined, and now, on the rough and hilly country, only small areas are to be seen growing, because of the high cost of white labour, which has absorbed the profits, the grower finding that, after waiting two years for his crop to mature, very little was left over after paying expenses. Some growers sowed down their land with grass, and embarked on the dairying industry; others allowed the lantana to grow up, then brushed the lantana, burnt it, and planted bananas. Some of the plantations in this district look extremely well; and it is fortunate that the banana seems a crop which can be successfully grown in very rough country, because some of the sites selected for banana plantations are so steep and rocky that it is an impossibility to cultivate by means of horse power. In this district can be seen bananas growing most luxuriantly amongst masses of rock and huge boulders.

Some of the essentials for success in banana growing are a good rainfall, a well-drained and warm soil, rich in potash, and a sheltered position; the rain should fall chiefly in the summer, when the soil temperature is high, the chief growing period of the banana, and also in the spring, to give them a start after the winter. Shelter from rough and cold winds is necessary, because of the immense weight of the bunches causing the stems to sway about when the huge leaves catch the wind, and in consequence the sucker is either broken off or uprooted. The leaves become torn in strips by the wind, but their efficiency is not much impaired by the tearing, because the vascular bundles run parallel to each other, and are not broken across; thus their functions are not interfered with.

From reliable reports we learn that bananas—plants and bunches—remove from the soil the following in lb. per acre:—Pure potash, 271·48; phosphoric acid, 22·52; lime, 102·15; nitrogen, 84·54. These figures convey to our minds the immense importance of potash and lime for bananas. Just as the speed of a locomotive is governed by the amount of fuel and water to supply the steam, so the development and quality of the banana depend on the available supply of plant food. The banana plant is naturally a very rapid grower, and the enormous quantity of potash must be readily available. An insufficient supply is known to adversely affect the formation of carbohydrates.

As before mentioned, the bananas in this district are being chiefly grown on old sugar-cane land, which has been permitted to become overgrown with lantana, and, when burnt, the lantana has furnished a supply of potash in its most available form. This, I believe, explains why, where there has been a heavy growth of lantana, followed by a good burn-off, the bananas during the first four years thrive so well, the enormous growth of foliage, with that dark green, healthy colour, denoting abundance of available plant food; while the bunches are large and well developed. But under this heavy strain of cropping the requisite plant food becomes exhausted more quickly than nature can supply it, the plants assume a yellow-green colour, the bunches are smaller, and eventually the plantation becomes neglected, because the crops no longer pay for the labour required. Disease then soon asserts itself, and the grower blames the soil, the weather, the supplier of the stools, or anything but himself.

We must remember that bananas are surface rooters, and in comparison to their size their roots do not extend a very long way, whereas the majority of fruit trees establish a system of roots extending in all directions, growing to a great depth, as well as covering a large area: they also take several years to establish themselves before the heavy demands of fruit-bearing are made. Trees have been known to send out roots long distances to procure food or water not found close at hand. Bananas are not adapted for this, and if the necessary food is not within easy reach they soon assume an unhealthy and stunted appearance.

We also learn that lime is very necessary for the banana. Having tested samples of soil in this district with dilute hydrochloric acid, I have found it very deficient in lime. Owing to the continued growth of sugar-cane in this district for many years, the soil has become acid in reaction; and it is a well-known fact that microfungi are favoured by an acid reaction, and the action of bacteria which fix nitrogen is hindered. Not only does lime prevent fungoid diseases, but it cures them on soils where they already prevail; dressings of lime also render available both potash and phosphoric acid, which are brought into a more soluble form; and just at this time, when the world's largest store of potash is locked up in Germany by the war, it is well to bear in mind that a liberal application of lime to soils deficient in such is a good investment.

It is erroneous to conclude that if superphosphate of lime or bones, which are phosphate of lime, be supplied to the soil these fertilisers will supply the lime required. Lime or its carbonate is required in the soil to supply a free base. Superphosphate is saturated with sulphuric acid in the process of its manufacture, so that there is an excess of acid, and the use of this fertiliser reduces the amount of the carbonate of lime in the soil; in fact, used on land deficient in lime, superphosphate has a favourable influence on the spreading of some fungoid diseases, by reason of its increasing the acidity of the soil.

Basic slag is a phosphatic fertiliser which supplies both phosphates and lime to the soil; under normal conditions it is a cheap manure, can be safely stored in bulk, and, where land is deficient in lime, basic slag will give much better results than superphosphate. Basic slag requires a good rainfall to assist in bringing it into action, as it is a very slow-acting manure, requiring eight to twelve months before its effects are seen. On light porous soils lime exerts a good influence in causing the cohesion of the fine particles; thus the soil becomes more retentive of moisture, enabling crops to better withstand spells of dry weather.

A simple method of testing the acidity of the soil is to procure some blue litmus paper from the chemist, and wrap it round a ball of moist soil; should the litmus paper gradually turn red, it denotes an acid soil; if some soil which has received a dressing of lime be wrapped up in the red litmus paper it will change it back to blue. It is advisable not to handle the litmus paper previous to the test, as such will turn it red and spoil the test. A better and more effective method is to use a flat-bottomed glass, in the bottom of which is placed a round piece of litmus paper, and on top a round piece of white blotting-paper, the same size, both resting on bottom of glass; next place some soil which it is desired to test in the glass, and moisten with clean rain water (rain water being more likely to give an accurate test than spring water containing minerals), and stand for an hour or more. Should the colour of the litmus paper be changed to red, it indicates an acid soil, and a dressing of lime will benefit. A quick change of colour shows a very acid soil; lime in such a case is very necessary, and the soil should receive liberal applications of from 5 cwt. to 10 cwt. of lime per acre every second year. Better results are obtained from frequent applications of small quantities than heavy dressings of 2 or 3 tons at one application.

As previously mentioned, disease soon asserts itself in a neglected plantation, because starvation of an essential food constituent may act as a specific cause of predisposition; the whole matter of immunity from disease is very closely related to the nutrition of the plant and its environment. Fruitgrowers in New South Wales and Queensland are fortunate in having the advice of a thoroughly qualified staff of experts, but much of their valuable assistance is rendered void simply because some growers are not alive to their own interests. When reports are tendered of diseases and pests, how frequently is the remark made, "It will not pay," or, "It is too much trouble." In the case of the merchant with large premises, carrying a valuable stock, and who neglects to insure such stock, if fire breaks out and consumes his goods, what farmer would not condemn that merchant for taking the risk? Yet, when methods are carefully described and advocated for the prevention and curtailment of diseases and pests, how often the farmer ignores them instead of adopting them, thereby increasing the production of the best crops, free from disease, and thus assisting to meet the demands of home consumption, and in this way preventing the profitable importation of foreign-grown fruit and products, and helping to grow an exportable surplus, so that capital may be sent into the country, instead of *vice versâ,* to purchase abroad produce inferior to that which can be grown here.

Bananas have many advantages over other crops; they bring in quick returns, their cropping period is more under control, and is spread over the whole year, affording a regular income, and they are not so subject to market gluts as fruit which reach maturity only at one season of the year, entailing a great rush of work. Bananas do not suffer materially from insect pests, and are more easily protected from the raids of flying-foxes, as they are cut and marketed when in an unripe state.

It is utterly useless to plant bananas within the frost zone, or in cold, exposed situations, so the grower does not run the risk of losing his whole crop, and having to wait another year for returns, as is often the case with growers of peaches, plums, and apples. Frequently, windfalls cause a serious depletion in the returns of the latter crop. Pilfering in transit has also to be considered. The large consignments of bananas which reach Sydney every fortnight from Fiji indicate the immense demand and popularity of the banana; and there is no reason why the bulk of this demand cannot be met by the banana districts of Queensland and the Tweed River if only growers would plant larger areas, organise, and place the whole trade, from the production to the marketing, on a thorough business footing. What has been done by the Fiji and Jamaica banana-growers can just as easily be done in Queensland and the Tweed district when rational labour conditions are again resumed.

An Occupation for Returned Soldiers.

Any Government having in view the settling of returned soldiers on the land could wisely decide on banana-growing in suitable districts. Enough bananas could be grown in the Queensland and Tweed River banana districts to supply the whole of Australia. No doubt if growers became as well organised as the National Utility Poultry Breeders' Association, who have lately secured the prohibition of the importation of Chinese eggs, they could prevail upon the Federal Government to greatly restrict the importation of Fiji bananas.

The Tweed district is an ideal one for successful banana culture; it is favoured with the greatest rainfall in New South Wales, an average of 70 inches a year being recorded. An abundant rainfall is essential for the best results in banana cultivation. The Tweed River, and numerous tidal creeks running inland, afford splendid facilities for getting away the fruit, per medium of motor launches, to the deep-water port and railway stations. It needs only to be stated that the Tweed River district is the nearest banana-growing district to Sydney, and it will be seen the immense advantage possessed by growers on the Tweed; with direct railway communication to Sydney, which will come in the near future, the full value of this advantage will be realised.

Financial Returns.

The writer, being a practical banana grower of several years' experience, is able to give the actual returns from an 8-acre banana plantation in bearing, for the last twelve months. The number of cases dispatched to Sydney and Melbourne markets was 1,413; the gross returns were £848 5s. 8d., giving an average of 12s. a case. The freight, commission, cartage, and wharfage charges were £172 15s. 4d., cost of cases made up at the saw-mill was £82

8s. 6d., giving a net return of £593 1s. 10d. It is concluded that the grower would have his own horse and cart to convey bananas to railway station or wharf, and cart back cases; if not, then a further charge would have to be allowed for. Providing the soldier had the use of all his limbs, and his wife assisted him in the packing of the fruit, and a son in weeding the bananas, there would be no heavy wages bill to pay; if no son was available to assist, about £150 would have to be incurred for the labour of a man.

There are instances of better returns being received than the one given; but it is desired to give an average case, because nothing so much discourages a man who, supported by an over-roseate picture of exaggerated examples of profits, embarks upon some industry, only to find they do not come up to expectations based upon the extraordinary reports.

The Class of Soil Required.

The soil, aspect, and situation are the chief contributing factors for or against higher returns being obtained than the one given. Anyone contemplating banana culture, if able to do so, should choose well-drained, rich, volcanic soil, preferably virgin scrub, in a sheltered position, with a north or north-easterly aspect. He should also have in view a near and easy outlet to a good main road leading to wharf or station, because bananas are heavy fruit to cart; 1½ bushels is the standard case, and about twenty-five of these go to the ton. If the grower's plantation is near the river or creek considerable carting will be saved.

It is advisable not to select land surrounded by paspalum grass paddocks, as the grass seeds become washed into the banana plantation, involving more labour in the operation of weeding. Lantana land suitable for bananas can be rented for £2 to £3 per acre a year; brushing the lantana, burning-off, and grubbing out the roots would cost from £4 to £9 an acre, depending on the age and density of the lantana, and whether a good or poor burn-off was experienced. Bananas are grown from suckers, which are planted from 10 feet by 10 feet apart to 12 feet by 12 feet apart, requiring (planted on the triangular system) 502 and 348 suckers respectively. The latter distance is recommended in very rich soil and the most sheltered positions, as the growth is much more luxuriant, and the greater space is needed for the full development of the suckers; even 12 feet by 14 feet apart is not too wide if horse power can be used for keeping down the weeds. In situations too rough for the use of horse power in harrowing to control the weeds, and in more exposed aspects, 10 feet by 10 feet is the best distance apart to plant, because the closer planting provides more shelter against winds, while the ground is more shaded, and thus weeds have not quite the same scope to grow.

Banana suckers can be purchased at from £1 to £2 per hundred. The intending planter should be certain of obtaining suckers from a good, healthy, and vigorous plantation; this is most essential. If without experience, he should ask some reliable grower to inspect the suckers, or, better still, visit the plantation where the suckers are to be procured. It is most important, for the best prospects of the intending banana planter, to take every precaution to guard against introducing disease and pests at the beginning. "Prevention is better and cheaper than cure." If the planter takes the necessary trouble to select suckers free from disease he will save himself much worry and, perhaps, costly efforts to eradicate disease; also, providing he has chosen the right soil and situation, he will have laid the foundation of success.

The suckers should be planted in straight rows, in holes dug 15 inches deep and about 2 feet wide, the returned soil being well firmed around the "bulb." This promotes root action, and should wet weather be experienced, followed by strong winds, the suckers will not so likely be blown over in the early stage before they have formed roots to anchor them. It is not necessary to fill up the hole completely, as subsequent cultivation will do this work. From August to Christmas is the best season to plant, because the suckers have the benefit of the whole summer and wet season to make a good growth before the more dormant period of the cool months. If strong suckers are planted in rich soil, followed by a good growing season, the first bunches will be ready for cutting at the end of eighteen months, and from then on continuous cuttings can be made every week; as every bunch is cut, the sucker bearing it is cut down, and others shoot up and bear a bunch each. April is the best month for a plantation to commence bearing, because the glut of other summer fruits is over, and bananas are then in great demand. From April to Christmas the best prices for bananas are realised, so the intending planter should plant his suckers and regulate them to come into bearing during the best selling months; if planted in September the plants would commence to bear in March, eighteen months after being planted.

The Cavendish is the most suitable variety for the Tweed district; the plant is hardy, withstanding the sudden changes of temperature. Its habit is dwarf (attaining a height of only 10 or 12 feet); therefore the suckers are not so likely to be blown over when loaded with heavy bunches. The fruit is a general favourite, of a finer flavour and more luscious than other varieties. Unfortunately, the Cavendish does not carry as well as the Gros Michel, therefore it is best marketed in cases to prevent the rather delicate skin becoming bruised.

The banana is a seedless fruit; no doubt in its early wild state the fruit contained much seed and very little flesh or pulp. Man, desiring to improve it for use as a food, naturally selected suckers from the plants producing bananas with the least seed in them; consequently, in time, by selection over a long period, the seedless banana was evolved. For this reason, if we wish to further improve the fruit, we must continue this selection, choosing suckers from strong, vigorous plants producing the largest bunches of well-formed fruit. In cases where plants have been cultivated and propagated for generations by suckers, cuttings, or shoots, and division of roots, they have almost lost the power to produce seed, and, in fact, the seed-producing organs are almost sterile. The banana, pineapple, and sweet potato are examples. In rare instances sports do occur, and, if noted by an observant man, may be selected and propagated.

Poultry Notes.

OCTOBER.

JAMES HADLINGTON, Poultry Expert.

The Practical Feeding of Poultry from Chicken to Adult.

It has been the aim of these notes to inculcate simple methods in feeding as in other matters in connection with poultry, so that the novice poultry-farmer need not study the intricacies of the chemical analysis of foods, thus enabling him to avoid the many pitfalls which such would lead him to. To this end the methods recommended by me and followed at the Hawkesbury Agricultural College have been published from time to time; but notwithstanding this, the demand for information on the subject of feeding poultry appears to be as great as ever. This appears to result from the great mass of more or less impracticable ideas and suggestions that are continually being launched upon the poultry world. The poultry-keeper is advised to use all sorts of foods for his stock; but unfortunately, most of this advice is not accompanied by the necessary qualification as to whether these articles are available in sufficient volume, or whether they are sufficiently cheap to be regarded as economical. Added to this, the published chemical constituents of many of these articles and the glib way in which poultry men are encouraged to believe they can balance their rations by or with them, only leads to the whole subject becoming so confused that the novice often finds himself in a state of bewilderment in regard to how and what to feed.

It goes without saying that poultry (both chickens and adults) might be, and often are, fed on a great variety of foods. The main question, however, for our consideration is simplicity and economy of feeding to secure maximum results in production, not alone of eggs, but the attainment of the requisite development in our specimens. At the present time our most economical staple poultry foods are wheat, pollard, bran, and lucerne, followed by maize. This then determines the foods which go to form the bulk of our poultry ration from an economical point of view. The next consideration is that a ration composed solely of these ingredients, as compared with that which has proved so successful in the College operations, contains rather too much carbohydrates as compared with protein. To meet this objection, and to make it of a rather narrower ratio, the practice is to introduce something of a higher proteid content, usually meat offal, meat meal, or blood meal, or such vegetable substances as linseed meal, gluten meal, coconut oilcake, &c., all of which are richer in protein than wheat, maize, pollard, bran, and lucerne. Unfortunately, the use of linseed meal, oilcake, &c., is somewhat restricted by considerations of palatability and digestibility, which are also important factors in making up the ration. To give a simple illustration in regard to making up a ration, one made up of the usual proportions of wheat, maize, pollard, bran, and lucerne would approximate a ratio of 1 : 5 or 1 : 6, according to the samples used, whereas the accepted nutritive ratio, based on the daily quantity of food supplied, say, for laying hens, is about 1 to 4·5 or 1 to 5—that is to say, one part of protein to four and a half or five parts of non-proteid matter. This is also found to be an efficient ration with which to feed growing stock.

Therefore, with the object of increasing the proteid content to the desired proportions, we introduce some food of a higher nitrogenous value, such as meat, meat meal, &c., as before mentioned. Thus, for example, if we are using a ration composed of, say, 60 per cent. pollard and 32 per cent. bran, in conjunction with wheat and maize, it would require the addition to the mash of 8 per cent. of a meat or blood meal showing on analysis 40 per cent. proteids, to balance our ration to the desired standard of 1 : 4·5 or 1 : 5. It therefore follows that if we are using an animal meal of higher proteid content, less than 8 per cent. of the meal will be required. As an example, if using a meal containing, say, 60 per cent. proteid, only about 5 per cent. would be necessary. To balance it with, say, linseed meal would require from 16 to 20 per cent., an amount regarded as somewhat too high for constant use.

According to recently compiled analyses made by the Chemist's Branch of the Department of Agriculture, the proteid content of an average sample of wheat is from 8 to 10 per cent., and of maize from 10 to 11 per cent., while the proteid content of average quality pollard and bran is about 17 per cent., and good dry lucerne chaff or dust from 16 to 19 per cent. Linseed meal might vary from 20 to 24 per cent.; while meat and blood meals, including rabbit meal, generally range from 40 to 60 per cent.

The meaning, then, of balancing a ration is to regulate the quantity of proteids to those of carbohydrates and fat to conform to a standard which results have shown to be efficient in practice.

Rations Fed at the Hawkesbury Agricultural College.

To those who have perused the returns of the Laying Competitions at the Hawkesbury College it will be obvious that the results there obtained could not have been secured unless the ration was of a suitable character, and in addition, the class of development obtained in the young growing stock at that institution points to the same conclusion. Such simple methods of feeding which have been proved to be safe, economical, and sound in application may therefore be safely followed by the average poultry man. It is therefore proposed to give details of the method and range of feeding of the College stock, including those in the Laying Competition:—

1. Chickens coming from the incubators are fasted for thirty-six to forty-eight hours.
2. They are then fed for two days simply on dry rolled oats.
3. From that time onward to six weeks of age the chickens are fed on moist mash, consisting of pollard and bran mixed with hot milk,

in which has been dissolved 1 oz. of common salt to every 5 lb. of mash. This mash forms from two-thirds to three-quarters of the entire food given during the day, and at about two-hour intervals, followed by chicken mixture in the evening. There is no objection to a little of the mixture during the day. As much finely-chaffed green feed as they will eat is supplied from the second week.

4. From six weeks onward to ten or twelve weeks the same mash is given, with perhaps the milk omitted, and the adult mash given for morning feed (see formula for adult mash). These receive four feeds per day at regular intervals, the last of which is wheat and cracked maize in proportion of two-thirds of the former and one-third of the latter. There is no objection to half of each.
5. When the chickens are removed from the rearing yards to the colony enclosures at, say, ten to twelve weeks old the number of feeds is reduced to three per day, two of which are of mash, made in accordance with the adult formula, and the evening feed as above.
6. When the birds are fully grown and have been removed to the ordinary adult pens the number of feeds per day is reduced to two—mash in the morning and grain at night, with as much chaffed-up green feed at midday as they will eat.

Mixing Mash for Chickens.

The method of mixing the food for chickens is as follows:—Take the proportion of bran, say about one-third, place it in a bucket or other receptacle, then pour over it as much milk or other liquid as will allow of about two-parts of pollard to be absorbed by it, working the whole into a crumbly mash. Should the pollard be finer than the average, up to half bran may be used. There is little or no objection to the use of that quantity of bran, because in food value there is so little difference as not to make any material alteration in the nutritive ratio or value.

Mixing the Adult Mash.

Take one part by weight of bran, add the meat meal, then pour over it sufficient liquid, into which has been dissolved a quantity of common salt equal to 4½ oz. for each bushel of food to be mixed. The bran should then resemble a wet mash in the form usually given to horses or cattle; then add two parts by weight of pollard, and mix thoroughly into a mass that will be of a consistency that can be balled by the hands under slight pressure and will fall to pieces when thrown down. Should the pollard be of a coarse description use less bran; on the other hand, should it be fine more bran may be used, remembering always that the nutritive value of both are so nearly identical that from that point of view the proportions are immaterial. No apprehension need be felt about using plenty of bran; at the same time it is not desirable that the mash be mixed too crumbly; it should have a certain amount of adhesiveness, otherwise it is not nearly so appetising and much will be wasted.

In regard to other materials that might enter into the composition of the morning mash, such, for instance, as linseed meal, coconut cake, &c., more than 10 per cent. (by weight of the total feed) of these cannot be recommended, and when they are used the quantity of meat or blood meal ordinarily added to pollard and bran to balance the ration should be reduced to about two-thirds of the normal amount.

General Remarks on Feeding.

In cases where good green lucerne is available, this might be chaffed and used to the extent of about one-quarter by weight of the entire morning mash, in which case little bran should be used.

It is desirable that troughs should be used to receive the mash, otherwise some waste will occur, besides which it is more sanitary than throwing such food on the ground.

It will be noticed that no mention has so far been made of oats and barley; these grains are regarded as inferior to wheat and maize for poultry principally from the fact of their high fibre content, amounting to about 10 per cent. At the same time it is permissible to use from 10 to 20 per cent. of these cereals in connection with wheat and maize.

Maize is not sufficiently appreciated as a poultry food, and the idea that it is too fattening for laying hens should not be entertained; as a matter of fact, we could feed with advantage much more of this grain than is generally used.

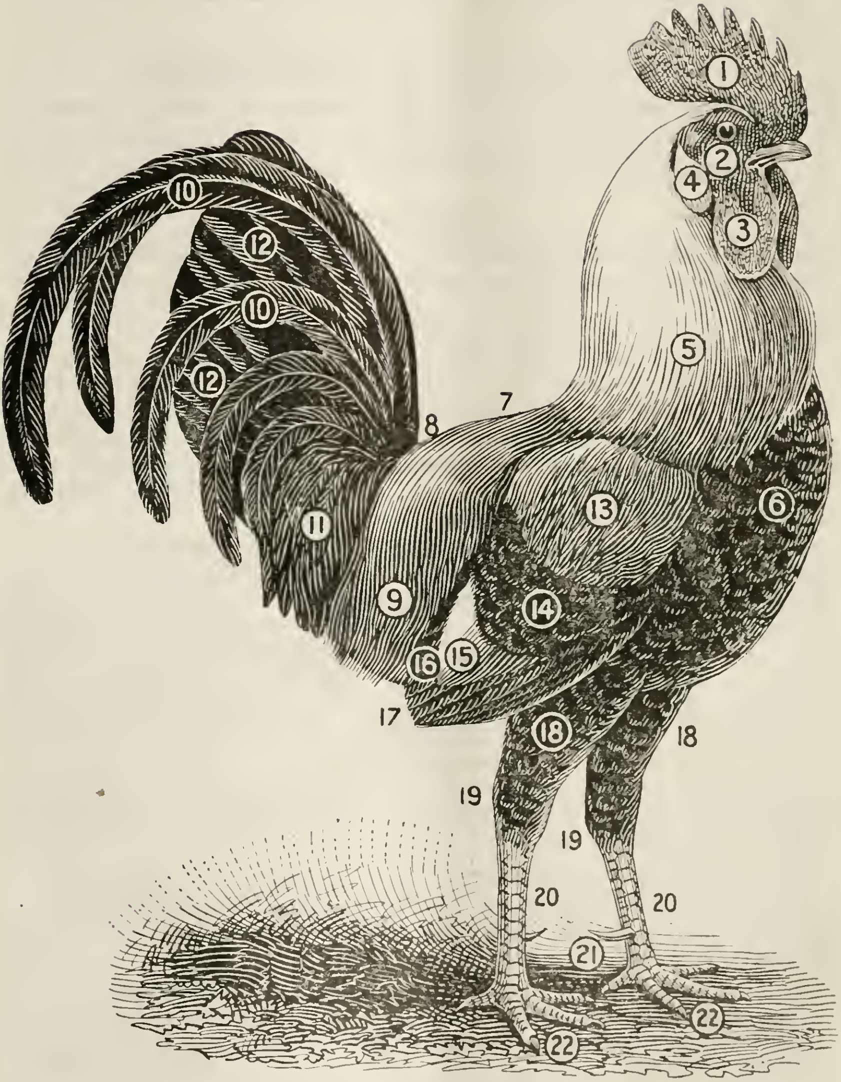
In connection with the question of a balanced ration it might be mentioned that it is not possible, owing to the variations in the analyses of the same class of foodstuffs, always to have an accurately balanced ration; at best it can only be approximate. Neither is it absolutely necessary that it should be exact, because any slight variations in the ratio, and even perhaps what might be by some regarded as a rather wide variation, is balanced by the quantity of food taken by the birds. It is even questionable if any two birds would be best served by exactly the same ration.

A supply of shell grit in sizes to suit the different ages should always be kept in receptacles before the birds.

No attempt should be made to restrict the amount of food consumed except when it becomes necessary for the purpose of sharpening their appetites. This is why no stipulated quantities are set out here, but for general information it may be stated that each adult bird will eat at each feed approximately from 1½ to 2 ounces.

Points of a Fowl.

It often becomes necessary when mentioning the standards of the various breeds to refer to the different points of a bird. With a view to assisting readers of these notes to grasp what is meant in such cases a diagrammatic figure is published, showing the different points referred to in the standards.



Points of a Fowl.

1. Comb.
2. Face.
3. Wattles.
4. Ear-lobes.
5. Hackle.
6. Breast.
7. Back.
8. Saddle.
9. Saddle hackles.
10. Sickles.
11. Tail coverts.
12. True tail feathers.
13. Wing-bow.
14. Wing-coverts, forming the bar.
15. Secondaries—the lower ends forming the wing or lower butts. Wing bay—diamond.
16. Lower wing butts.
17. Primaries, hidden by secondaries when the wing is closed.
18. Thighs.
19. Hocks.
20. Legs or shanks.
21. Spurs.
22. Toes or claws.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bankstown.

A meeting of this branch was held on 26th August, the main proceedings consisting of election of officers and the adoption of the balance-sheet.

Bimbaya.

At a meeting of this branch held on 30th July, a discussion on soils took place, based upon a paper on "Soil Surveys," by Mr. F. B. Guthrie, which was read. In the comments that followed, Mr. Geo. Alcock expressed the opinion that reliable soil surveys would be of great value to the district. The resulting soil map should indicate the portions of the district most suited for the various fruits and cereals, also whether a trial was warranted of anything not at present grown here.

Mr. E. T. Boller considered that, when it was realised that the farmer got his living exclusively from the soil, his (the farmer's) knowledge of the soil was far too meagre. Some steps should be taken to prevent the excessive soil waste that took place throughout the district by reason of its hilly nature. Since the advent of the rabbit this waste had greatly increased. By reason of the injudicious clearing of logs from hillsides, much of the most fertile soil was carried away by heavy rains. This waste could not go on indefinitely without completely impoverishing the soil. Some of the older countries, notably Palestine, afforded an excellent object lesson of this.

The annual meeting was held on the same evening, when it was reported that the loan of books from the Country Reference Section of the Public Library was a decided success.

The membership of the branch still continued to show a steady increase.

The election of officers resulted as follows:—Chairman, Mr. Geo. Alcock; Vice-Chairmen, Messrs. T. Heffernan and E. T. Boller; Hon. Secretary and Treasurer, Mr. J. R. Boller.

It was decided, in view of the success of the library, to purchase, as the nucleus of a permanent library, a number of standard works on dairying, agriculture, and subsidiary industries. The provision of current literature was also decided upon by subscribing to some well-known dairying periodicals.

During the year the scope of the branch had been extended by undertaking the work formerly carried on by the Progress Association. This has resulted in an economy of time, besides giving deserving recognition to so important a matter as the provision and maintenance of roads.

It was resolved to further enlarge the branch's sphere of usefulness by instituting a register for the purpose of facilitating the sale and purchase of goods between members.

At the usual monthly meeting held on 28th August, an interesting discussion on fodder crops suitable to the district took place.

FODDER CROPS.

Several members said they had given the cowpea a trial for several seasons in succession, but without success. For some reason the district seemed unsuitable for its successful growth.

MESSRS. L. HEFFERNAN and GEO. ALCOCK considered that maize was one of the most profitable crops that could be grown, as almost every part of it could be utilised, and it was a splendid food for pigs and poultry, as well as for horses and dairy cows. It was pointed out that cows would not milk heavily when fed on green maize alone, the reason being that it was not a properly-balanced ration.

Several members advocated the growing of lucerne wherever the soil was suitable. Four or five cuttings could be taken in a favourable season, the hay was much relished by dairy stock, would keep for an indefinite period, and was not liable to be destroyed by rats and mice as was the case with oaten hay.

It was mentioned that lucerne chaff was considered unsuitable for feeding to horses, though one member said he had used it for some considerable time and had noticed no ill-effects. It was usual to give animals a small quantity of saltpetre several times a week, mixed with the feed.

Clovass.

At a meeting of this branch on 21st August it was decided to buy seeds and distribute them to members to grow vegetables, &c., for exhibition at the annual Casino Show.

Cotta Walla.

A competition has been conducted by this branch with a view to encouraging the younger members to express their opinions and experiences. Prizes were offered for the two best essays, and the competition was limited to members under 30 years of age. The response was distinctly satisfactory, several very worthy contributions being received and forwarded to Mr. R. N. Makin, Inspector of Agriculture, for adjudication. Mr. Makin awarded first prize to Mr. C. W. G. Howard for his paper entitled "Fencing," and the second prize to Mr. W. E. Howard for his paper entitled "Potatoes."

POTATOES.

The potato certainly holds first place among vegetables, and is extensively grown in the district, where the soil and climate are suitable for its cultivation.

New red land is the best for potatoes, and always gives the greatest yields; but any cultivation land, if it is well and carefully cultivated and suitably manured, will produce good crops of potatoes.

The land should be ploughed three times. The first ploughing should be done in the autumn at a depth of 7 inches. Leave the land as open as possible through the winter, as frosts are very beneficial to the soil. In September the land should be cross-ploughed at a depth of 5 inches, and harrowed afterwards to conserve the moisture.

Planting should commence early in November for this district, and continue through the month. The potatoes should be planted 5 inches deep, 2 feet apart in the rows, and 2 feet 6 inches between the rows. This method allows sufficient space between the rows to use the horse hoe or scuffler for keeping the weeds down and preventing the surface from caking.

The selection of the seed is very important. All seed should be free from disease and true to variety. I prefer medium-sized tubers for seed, that is, from the size of hens' eggs to the size of a teacup, the latter size to be cut into two sets.

When cutting potatoes into sets cut slantways across the potato; some people always split the crown end with the knife. This is a great mistake; the crown is the best set of all—to prove this, if a whole potato is planted the crown eyes are the only eyes that grow. The sets should be planted in moist soil as soon as possible after cutting, for the sets lose their vitality if cut a day or two before planting.

Manures that contain potash are the best for potatoes, because when potatoes are analysed they are found to contain a considerable amount of potash which must be derived from the soil or from the manure applied. Of course, potash is unobtainable now, for it is a German product. Superphosphate always gives increased yields; and when the cost and the additional yield due to superphosphate is compared with the cost and increased yield due to other manures on the market, it will be found that about 2 cwt. of superphosphate to the acre is the most satisfactory manure from a financial point of view. Most people sow the manure in a thin streak down the furrow with the sets, but better yields would certainly be obtained if the manure was spread so that all the potato roots shared equally.

The land should be harrowed at the end of each week's planting. Cross-harrow when the potatoes are coming up. When the potato crop is about 6 inches high they should be scarified to keep the weeds down. It is advisable to hill potatoes if the prospects are of a medium to heavy crop, otherwise some will grow out and become green and unsaleable. Hilling must be done before the plants flower, for after that period there is the danger of breaking some of the small roots that feed the tubers, and consequently reducing the yield.

Carman and Magnum Bonum are suitable varieties for this district. The former grows a number of good, round, smooth-skinned potatoes that sell well on the Sydney market. The latter, it must be admitted, is the surest cropper of all varieties grown in the district, and is also a splendid table potato.

Another variety, Early Manistee, has only been grown in this district a few years, has given splendid results, and it is the opinion of many people that it will be the king of potatoes. Other varieties that have been grown in this district some considerable time and have proved worthy of cultivation are Brownell's Beauty, Surprise, Queen of the Valley, Manhattan, Commonwealth, Coronation, and Up-to-Date.

When the potato tops are dead and the skins of the potatoes are set, the crop is ready to dig. The potatoes should be sorted in the paddock; that is, the size of a cup and upwards should be put in clean sound bags for market. The rest should be bagged up for the grower to pick his next year's seed from; the grower should pick his seed during the winter and spread them in a shed. In this way the potato will not shrivel, and a surer germination will follow the next planting season than if left in bags or pitted.

DEPARTMENTAL NOTE.—Mr. MAKIN drew attention to the statement "when potatoes are analysed they are found to contain a considerable amount of potash," and supplied the following analysis taken from Bulletin 28 of the United States Department of Agriculture: Water 78·3 per cent., protein 2·2 per cent., fat 0·1 per cent., carbohydrates (starch) 18·4 per cent., ash 1·0 per cent. Water and starch are, therefore, the chief elements in the potato tuber. Still, under certain conditions, manures containing potash have been found to produce increased yields as against those that did not supply potash.

FENCING.

The main points that must be considered in dealing with this subject are efficiency, durability, and economy. It does not matter where the fence is to be erected, whether as a boundary or subdivision fence, it is practically useless if it does not prevent stock from trespassing on a neighbour's property and *vice versâ*, or does not prevent stock from breaking through into cultivation land and destroying crops.

In this district, where we have to contend with the rabbit pest, it is essential that our boundary fences should be rabbit-proof; for subdivision fences the five-wire fence is the best and easiest to erect. Both these fences require the same class of timber, but the boundary fence must be bored to a gauge that will be handy and suitable for affixing the netting. Any man of ordinary intelligence can erect these suitable fences for the farm.

The life of a fence depends principally upon the class of timber used. In this district peppermint and stringybark are the best timbers for fencing; where they are not obtainable gum timber may be used. Box and apple-tree timber have greater lasting qualities than any of the above-mentioned timbers, but it is almost impossible to split these timbers into suitable sizes for posts. They do well for corner or straining posts.

The posts should be split from trees of mature age, which contain harder and more durable timber than young or very old trees. The best size for posts is about 9 inches by 4 inches and 6 feet 3 inches long; these should be placed 22 feet apart and be sunk 2 feet in the ground. The posts should be erected as soon as possible after they are split, for their lasting qualities are greatly diminished if they are left lying about until the sap has dried out of them. This particularly applies to gum timber, where the life of the post is almost doubled if erected while full of sap; but it is noticeable with all timbers that when the posts are erected green the butts will contain the sap for a considerable time, whereas dry posts will take the water and commence to decay in a short time. Care should be taken to place them upright and in a straight line, otherwise the fence will have an untidy appearance. It is necessary to erect a straining post in place of a split post every 8 or 10 chains. A handy size for a strainer is 10 to 12 inches in diameter and 7 feet in length; sink the strainer 2 feet 6 inches into the ground and give it extra ramming. A stay or prop, some 10 or 12 feet in length, must be placed against the post to help it to withstand the strain when the wires are tightened. The best method of placing the stay is to mortise a hole 3 inches deep, about 6 inches from top of post; trim one end of the stay to fit this hole and secure the other end of the stay against a flat stone that has been sunk about a foot into the ground. Two droppers about 4 inches by 2 inches and 4 feet 3 inches long must be placed between posts.

Boring is the next item, and for a boundary fence using 3 feet 6 inches netting, I consider the following gauge the best and most economical: Bore the bottom hole at 1 foot 6 inches from the ground, next hole at 3 feet 3 inches, and third hole at 4 feet 1 inch, or 2 inches from the top of posts. For 3-feet netting bore the bottom hole at 1 foot 3 inches, next hole at 2 feet 9 inches (allowing the netting to be sunk 3 inches in the ground), third hole at 3 feet 6 inches, and top hole at 4 feet 1 inch.

For the subdivision fence I would suggest the following gauge: Bottom hole 10 inches from the ground, second hole 1 foot 8 inches, third hole 2 feet 6 inches, fourth hole 3 feet 4 inches, and top hole at 4 feet 1 inch.

I always use barbed wire for the top wire of fences, because it makes the fence more formidable to stock, and prevents them from trying to get over it, and from rubbing and pushing against it and probably damaging the netting.

It is a good plan to run the barbed wire out first, strain it and tie it to the posts with No. 10 wire; then space your droppers and tie them on, again using No. 10 wire. There should now be no difficulty in running the remaining wires (No. 8 preferred) through the posts and droppers; strain the wires and then tie the droppers at the bottom wire to prevent them getting out of perpendicular and looking untidy.

Regarding the erection of the netting—dig a trench along the fence at least 4 inches deep; if the trench is not dug deep enough the bottom of the netting rests on the ground, and does not go on smoothly but has a baggy appearance.

Straining the netting a little certainly improves it, but care must be taken not to break it or pull it out of shape. Tie the top of the netting to the second wire of the fence with tie wire, using four or five ties between the droppers for the top of netting and two ties for the bottom wire. Fill in the trench and the fence is completed.

Cunningham.

A pruning demonstration was given by Mr. J. R. Moody, Assistant Fruit Expert, under the auspices of this branch on 8th August.

Mr. Kent, of Mount Dillon, Murrumburrah, placed his orchard at the disposal of the branch, and members and visitors were much impressed.

A summer pruning demonstration will also be arranged for if possible.

Mr. H. C. Stening, Inspector of Agriculture, gave an interesting lecture on "Mixed Farming" at the meeting of this branch on 16th August, when seven new members were enrolled.

Mixed Farming.

Mr. Stening said that a few months ago the columns of the Sydney newspapers were occupied by a discussion of great interest to the man on the land,

and in fact to the State generally, the subject of which was "Wheat or Sheep," and which subsequently led up to the holding of a conference in Sydney. If the discussion had been on the subject of "Wheat *and* Sheep," it would have proved of greater value in bringing out information that would have been distinctly of service to the farmers, as it would have probably influenced them to place their business on a sounder foundation. That portion of the State which is now known as the wheat belt, in years gone by experienced what may be called a sheep era. Later, when it was found that wheat could be grown profitably in those areas, out went sheep and in came wheat. What originally were vast sheep-walks underwent a process of subdivision and closer settlement, until in the last few years the wisdom of the old saying is being verified that "it is not safe to carry all your eggs in one basket." That means it was not advisable to adhere to one system alone on the land, but that mixed farming would be a safer policy. Following upon the subdivision of large estates for closer settlement, the values of land increased considerably. It was now being realised that it was necessary to improve upon the old methods adopted in this State. At some period or other of their history older countries have had to face a similar problem. England had arrived at a solution, and it did not need much study to find that the solution held good for most other cases. Hitherto, the pastoralists and agriculturists have been almost entirely distinct. Either calling may have been chosen, but it occurred to comparatively few men to combine the two. As far as the lecturer's experience went, he found that the farmers who combined the pursuits of both grazing and agriculture were the most successful and prosperous. What was generally known as mixed farming had solved the problem in England and provided greater profits. America with her great population had, like England, after extensive experiments, arrived at the same conclusion. New Zealand, where land had reached almost its maximum value, had progressed on the same lines. Australia, and more particularly New South Wales, could confidently accept mixed farming as the solution of the land problem. The question arose as to what combination would be the more suitable. If agriculture was to be united with stock-raising, what kind or kinds of stock would it be best to employ? Would it be cattle, sheep, or pigs? On very rich lands, in districts possessing a good rainfall, there was no more profitable class of live stock than the dairy cow. The raising of pigs was also very desirable. The growing of wheat and other crops, and the breeding of pigs were also very profitable, and proved an excellent system to be adopted in mixed farming. The decrease in the area cropped with wheat was being received by many with great apprehension, but to the mind of the lecturer it was not altogether an unmixed evil. Previously there had been many farmers who tried to crop too large an area of land, with the result that a large proportion was sown with very imperfect cultivation, and there was much late sowing. In some instances crops sown late had resulted satisfactorily; but the system was attended with too much risk, and in fact was too great a gamble. The general experience was that early-sown crops usually returned the best yields, while in dry years late-sown crops were failures, and were also more subject to disease such as rust. The reduction in area under crop would lead to better methods of cultivation, for no larger area would be sown than could be attended to properly.

Farmers would also find it profitable to run some sheep. Sheep were a class of live stock that could be handled very cheaply; they furnished quick returns and provided many sources of profit, direct and indirect, when bred on the farm, as they should be. Sheep were highly domesticated, and become readily adapted to circumstances. The question of carrying capacity must be carefully considered. Natural pastures, fallow, and stubble were insufficient to carry the full number of sheep throughout the year. With mixed farming breeding ewes should constitute the great majority of the flock, so that it was in autumn, when the lambs should be dropped, that the carrying capacity of the farm must reach its maximum. The direct profit from the sheep depended on the condition in which the lambs arrived at market, and the state of the ewes at shearing, both of which depended almost wholly on feeding.

Fodder crops, suitable for feeding off, must be sown. Crops of early autumn growth were very necessary. Experiments had been carried out with autumn fodder crops in the district over several years, and each year they had proved a success. The crops tested were different varieties of oats, Cape barley, rape, and field peas. Rape proved very satisfactory, as it grew vigorously, and produced a heavy yield of succulent fodder much relished by the sheep. It should be sown during the latter part of February, when there was sufficient warmth in the soil to cause rapid growth. It was an excellent rotation crop with wheat. It was not advisable to turn hungry sheep on to rape while it was wet with rain or dew. What was even better than rape alone for producing fodder was rape and Cape barley mixed, sown in alternate rows with the wheat drill. Oats have their advantages as fodder crops, particularly on land that was affected with "Take-all." Oats were practically immune to that disease, and thus starved the fungus. If the sheep were removed sufficiently early the oats could be utilised to mature for a crop of grain. Peas have also a special value in that they supply the valuable food constituents proteids, otherwise known as flesh-formers. During the interval between the harvesting of the cereal crop and the time when the fodder crops became available, the sheep could be provided with feed on the stubble. Every holding on which sheep were kept should have an area of natural pasture to be reserved as a stand-by, upon which the sheep can be run when the fodder crops, stubble, or fallow were not available. Variety in feeding greatly improved the condition of sheep. It would be a great advantage if the richer portions of the farm were sown down with lucerne—the king of fodder crops. It was an expensive crop to put in, but it lasted for a number of years, and provided feed throughout the greater portion of the year. It was a crop of considerable feeding value, and it also enriched the soil by storing up nitrogen. When properly established lucerne could stand drought, as the roots penetrated deeply into the soil. Autumn sowing was best, and it could be sown with a cereal, which would act as a "nurse" crop. It should not be grazed the first year.

The pastures should also be supplemented in summer by growing such crops as Sudan grass or Japanese millet for grazing off. In years of plenty any surplus from fodder crops should be converted into hay or silage to provide a reserve of fodder for times of drought. Sheep on a farm were an important factor in keeping the land clean of weeds, which they converted into meat and wool. For keeping weeds in check sheep could be regarded in the light of one of our best cultivation implements. The fallowed land should be kept free from weeds, but the sheep should not be allowed on the fallow during wet weather, as they would cause the soil to become too hard. Early-sown crops, which were making too much headway, were liable to become rank unless checked in some way. The crop could be fed down with sheep. Fallowing was a practice to be advocated as a necessity in dry districts in order to conserve sufficient moisture. Much benefit would result from the raising of pigs. They were generally regarded as dirty animals, but it was not correct when they were properly housed and treated. They could be allowed to graze on fodder crops, such as lucerne and rape, and they also turned into value many waste products of the farm. He (the lecturer) strongly believed in the wisdom of mixed farming, and could refer to Mr. B. J. Stocks, who had been successful in this district by following those methods.

Mr. STOCKS gave some particulars as to the progress made by him in following the system of mixed farming. He went in for wheat growing, lamb-raising, and also reared a good number of pigs, all of which resulted satisfactorily, and gave excellent returns.

Mr. ROBERT GIBSON said he considered the time had come when farmers should take up the system of mixed farming in a more practical way, and he felt sure great benefits would follow.

Garra-Pinecliff.

At a meeting of this branch on 15th August, Mr. S. W. Packham, Hon. Secretary, read articles from the *Agricultural Gazette*, including one on Sudan grass. It was decided to make trials with this grass.

The third box of books loaned from the Public Library was opened, and members availed themselves of the opportunity of studying the same.

Glenorie.

The usual meeting took place on 24th August, but owing to unfavourable weather conditions the attendance was small, and the election of officers was deferred.

Holbrook.

At the meeting of this branch on 31st August, Mr. O. Smith read an interesting paper on "The Anatomy of the Horse's Foot," from which it is hoped to quote extracts in a later issue. Mr. Smith was accorded a hearty vote of thanks for his paper.

Arrangements were made for the visit of Mr. J. W. Mathews, Sheep and Wool Expert, when a demonstration on the handling of sheep and wool would be given at the shearing-shed of Mr. J. C. Bowler, of Annandayle.

Kellyville.

At the meeting of this branch on Saturday, 7th September, the Secretary read the annual report, and the Treasurer presented the financial statement for the year, which included a credit balance of £3 10s. 2d. The branch closed the year with forty-one financial members.

The following officers were elected:—Mr. H. P. Smith, Chairman; Mr. H. H. James, Vice-Chairman; Mr. H. Firth, Treasurer; and Mr. J. H. Firth, Hon. Secretary.

Lidcombe.

The annual report of this branch reveals a gratifying state of progress. Though only completing its second year the membership now stands at eighty-five, and the twenty-four meetings of the year have been well attended. The Department of Agriculture provided for seven lectures by its officers, while Dr. Cleland, Dr. J. M. Suckling, Mr. Blackman (of the Parramatta Research Society), and others gave illuminating and interesting addresses.

Monthly competitions were held, the winner in section A (flowers) being Mr. J. Frost with 150 points, and in section B (vegetables) Mr. H. Laman with 115 points. Two garden competitions were also being conducted, one for the best improved garden of the year, points being given on entering the competition; and the second for the best garden in appearance.

A local storekeeper had placed his shop window at the disposal of the branch for an exhibit of vegetables and flowers.

Among other lines of activity may be mentioned the purchase of seeds through the Hon. Secretary (Mr. A. E. J. Anderson) at 33 per cent. discount, and of plants at from 10 to 50 per cent. discount, the purchase of sulphuric acid and sulphate of iron for swabbing grape vines, and the lending of a spray pump to members. One member had promised to prune the fruit trees of any soldier away from Lidcombe.

At a meeting on 9th September, an address was given by Mr. F. Wright, of the Technical College, on "Medicinal Plants," which proved of interest to the audience. He pointed out that it was not an easy matter to grow a plant that would yield a substance of medicinal value, and the large or strong growing plant could by no means be taken as being the best for the purpose. Then again, the producer is not sure of a market for the goods, nor has he any guarantee that he will procure a reasonable price.

Lower Portland.

The usual monthly meeting of the branch was held on 2nd September, and was well attended.

The election of officers for the ensuing year resulted as follows:—Mr. R. M. Smith, Chairman; Mr. B. King, Vice-Chairman; Mr. R. J. Metherell, Hon. Treasurer; Mr. W. C. Gambrill, Hon. Secretary; and Mr. H. W. Metherell, Assistant Hon. Secretary.

The annual reports of the Secretary and Treasurer were received, and both were considered very satisfactory. They showed that the membership is now forty-eight, and the financial position of the branch is good. Meetings were held regularly throughout the year, and papers were read on subjects which were beneficial to all. Some of the most important events of the year were a concert and social in aid of the Windsor District Hospital in August, 1917, as a result of which the sum of £14 was raised for that institution. Later in the year a social was held in aid of the prize fund of the local show. In May last year the Second Annual Agricultural and Horticultural Show was held at Lower Portland, and the function reflected great credit on the exhibitors.

It is pleasing to announce that the branch staged a Bureau exhibit at the Hawkesbury District Agricultural Association's Show in May last and secured first prize.

A member then read a paper on "Lime in the Orchard" from one of the agricultural journals, and a very interesing discussion took place on this subject.

Matcham.

A meeting was held on 17th August, when Mr. H. G. Parry, District Secretary of the Fruitgrowers' Association of New South Wales, addressed members on the benefits of organisation. A general discussion took place on the cultivation of rock melons and cucumbers. Steps are being taken to prepare a local exhibit at the next Gosford Show.

Moss Vale.

The regular meeting of this branch was held on 23rd August, thirty-one members being present.

The usual discussion with regard to suitable work for the ensuing month took place, after which Mr. Kettle, of Tallong, gave a very instructive lecture on "Orcharding." He dealt with the operations from the starting point: clearing and preparing the land, when and how to plant, the most suitable varieties for the district, and what to spray and when. In addition to these items, he also touched on the preparation and handling of the spraying mixtures; also, how to pack and store the fruit. As he has gained a considerable knowledge of fruit-growing from practical experience and was successful at the last Royal Show, he was able to impart a lot of useful information. A hearty vote of thanks was accorded at the conclusion of the lecture.

Penrose-Kareela.

A meeting was held on 2nd September, when a discussion took place on several matters of interest to orchardists.

Quaker's Hill.

At a meeting of this branch on 24th August formal business only was transacted. Some difficulty has been experienced in arranging for good gatherings, as patriotic fixures have fallen on the evenings set apart for the regular meetings.

Spencer.

A paper on "District Timbers" was read by Mr. S. M. Kelly at the meeting of this branch on 17th August.

DISTRICT TIMBERS—THEIR USES AND DURABILITY.

It is only intended to make a few remarks on some of the principal timbers that are generally used in this district. Living, as I do, on a farm that has been occupied for over eighty years, I have had a fair opportunity of noting the merits of the different timbers that were used in the early days. It is safe to say that there is no country in the world richer than New South Wales as regards its forest wealth. When the war is over, no doubt, there will be a big export trade for our colonial hardwoods, some of which have not received the attention which their merits deserve. Our forests, as a rule, require no artificial replanting, as there is always a good supply of young trees when the old timber is cut down. What is required is simply to protect it from bushfires, and to thin out weedy or sickly saplings. Most of our best timbers are found on the coastal districts.

Ironbark is the king of the forest as regards Australian hardwoods. It is extensively used for railway sleepers, bridge construction, posts, naves, spokes, &c. It is not excelled by any other hardwood for combined strength and durability. Ironbark is often found curly in the grain, and on that account is troublesome to plane, and blunts the tools before one can get a smooth surface. Ironbark will last in the ground for seventy or eighty years.

Stringybark I consider comes next to ironbark for strength and durability; in shady situations it will last longer than ironbark. It resembles tallow-wood in appearance; and if felled in the proper season and carefully seasoned, I think it will be found to last as long as tallow-wood.

Turpentine is a very useful timber; it requires to be well seasoned or it will warp and split. Millers and sawyers do not like it, as it dulls the saw. It is generally used for piles in wharves and jetties, as it resists the cobra, &c. It is also used for building purposes, as it is almost proof against white ants. The best floor that I know of is of turpentine, and is in a cottage built fifty-five years ago; the boards are as sound now as on the day they were put down.

White mahogany is a name given to a timber which I always considered belongs to the stringybark family; however, I suppose it is too late to alter the name now. It is one of the most durable timbers that we have in the district. It can be used when very young; posts taken from a tree 10 or 12 years old will last for thirty years. I know of no other timber so durable when young. It is another of our hardwoods that should receive more attention.

Spotted gum is a smooth-barked tree; the outer bark often peels off in patches, and gives the trunk a spotted appearance. The timber is of a brown colour with a pretty grain, which looks well when polished. It is very tough and durable. It is generally used for wheelwrights' and coachbuilders' work. It is also used for shafts and poles of drays, naves, and spokes, and in housebuilding generally.

Red mahogany is a timber which resembles the American wood of that name, but is not so light as the American timber. It is of a rich red colour, very durable, and becomes very hard with age. It resists white ants, and does not discolour paint. It is generally used for building purposes, principally weatherboards.

Blue Gum.—This timber is of a pale red colour, straight in the grain, and comparatively easy to work, and is therefore a favourite with carpenters. It is largely used by shipwrights and wheelwrights, and is a very useful timber. It is one of our hardwoods which varies a good deal in quality. In some districts it is found more durable than in others. It is found in the coast ranges, north and south.

Bloodwood—so called on account of the large quantity of blood-like veins and gum—is one of the most durable of Australian hardwoods, principally used for fencing material, and sometimes in culverts and bridges.

Oak.—There are three varieties of oak in this district—Forest, Swamp, and Sheoak. The first-named is generally used for shingles; it is also excellent wood for cabinet and turnery work. Swamp oak is much prized for bullock-yokes, as the timber when dry is comparatively light and tough, and the bolts do not work loose. Sheoak timber makes excellent malls, tool-handles, ornamental walking-sticks, &c.

Forest Red Gum.—This tree is generally found in forest country. The wood is of a deep red colour, generally inlocked in the grain, heavy and durable; much esteemed for fence posts, used also for naves and felloes of wheels and for general building purposes. It should be useful also for wood-blocks.

The principal softwood timbers in this district belong to the Sassafras family; they comprise useful timbers, which are generally used locally. When they become better known there will be a greater demand for them. Coach-builders consider that coachwood is one of the best timbers in the State for their work. Most of our brushwood would be suitable for fruit-cases and butter-boxes.

Springside.

On 7th September Mr. Scarr read a highly instructive paper on "Pruning," from which the following extracts have been taken:—

PRUNING.

Fruit trees will grow and bear fruit without pruning. Nevertheless the large majority of practical and scientific men recognise the necessity for pruning of some sort, and for all kinds of fruit trees.

Pruning is practised upon fruit trees for a great many different purposes, the most important of which are as follows:—

1. To encourage new growth.
2. To shape the tree; and
3. To regulate fruit growing.

1. If trees are showing a very small growth when they should be doing otherwise, then I certainly recommend a severe cutting back, also a good dressing of manure; and if no response is given the following year, by all means remove the tree and have a new one planted in its stead.

2. When planting young trees there are sure to be some that will require more attention than others. If they are badly formed then prune severely; by doing so a rank growth will be encouraged and there will be but little trouble in forming the tree.

3. As regards fruit bearing, we find that trees differ very much in this respect. Some varieties of pears will not bear fruit to any great extent while the tree is headed regularly each year; but, on the other hand, if left alone, except for the thinning out of growth that is not required, the tree will, in the course of about two years, bear a good crop of fruit. This practice may be applied to pears, cherries, and a good many varieties of plums. As regards apples, I suggest pruning to a fair extent each year till the tree is well grown, because in this district they do not grow so vigorously as do other sorts of fruits, and by the continual cutting you encourage growth and tend to check the tree from throwing too many fruit buds. Some varieties of plums may be treated in the same manner, but for a different reason; the President in particular, as this tree, if left alone for about two years, bears its fruit on the extreme tips of the limbs, leaving the body of the tree quite bare.

It is not only essential that we should know how to prune, but when and why pruning should be done.

General pruning is carried out during winter, because at this period there is but the naked tree, affording a better chance of shaping and balancing it. At this time the removal of large limbs does not affect the tree as it would in summer.

Cherry trees should not be pruned during frosty weather, because the wood of this tree is not hard, and it also has a soft centre, by which the frost will sometimes penetrate for several inches. Even if the limb does not die back it may remain dormant for several months.

Summer pruning is practised for one purpose only. When trees are making their early growth it is very beneficial, if time is available, to pinch out all unnecessary growth; also to check limbs that are making more growth than is required to keep an even tree.

In conclusion, I strongly advise beginners not to adhere strictly to theory unless this is based upon experience gained in the particular locality, as practically every fruit-growing district in New South Wales has different types of soils. So do our trees differ both in their growth and also in their tendency towards fruit-bearing. On this point I think many are led astray. They consider that what they read within the covers of a well-bound book can be practised in every locality with success, a mistake which certainly causes the downfall of many would-be orchardists.

DEPARTMENTAL NOTE.—In (1) the writer recommends cutting back the weak trees hard, and also manuring. The Fruit Expert considers this particularly worthy of emphasis, as the point is often overlooked that pruning alone cannot build a tree. The tree must have suitable conditions, and if it is not growing satisfactorily it is advisable to look for the cause and if possible remedy the trouble.

It may also be mentioned that the Department considers that the remarks on summer pruning apply very well to the training of young trees, but in some cases it is advantageous to practise other methods of summer pruning for other purposes.

Tallewang.

At the meeting on 31st August an informal talk on "Book-keeping on the Farm" took place. Th concensus of opinion was that every farmer should keep the following books as being necessary to the effective recording of transactions:—Cash book, ledger, stock and plant book. With these regularly entered at intervals of a week or less, and the taking of an annual inventory of the whole of his property and effects, it was thought that every farmer would be able to keep an effective check on his financial affairs.

Thyra-Bunaloo.

A useful paper on the relative merits of motor traction and horses for farm work was read by Mr. J. Sinclair at a meeting on 17th August. The conclusion arrived at by the writer was that on most farms at the present time, when horses are cheap and oil fuels scarce and dear, the farmer should be content with horses.

Tingha.

For the benefit of members interested in spraying, Mr. Browning, at Crystal Hill, on 13th July, gave a demonstration in the control of Woolly Aphis and San José scale.

SPRAYING.

As the trees had lost their leaves, winter spraying with one of the proprietary miscible oils was being carried out for the purpose of checking the ravages of San José scale and Woolly Aphis. The preparation, as taken from the original tin, was a blackish-brown liquid, but after being broken down by the addition of water it left the nozzle as a fine milky spray, showing complete emulsification.

Mr. BROWNING stated that he had tried the ordinary red oil, but had discontinued its use, because he had found it very difficult to obtain a proper emulsion, so that it was impossible to gauge the correct strength.

The apparatus consisted of a barrel spray pump, mounted on a slide so that it could be easily and quickly shifted, a length of rubber hose, and a batten, to which the nozzle end of the hose was secured, enabling the sprayer to work round the trees, and to spray thoroughly from top to bottom, so that even the smallest twig received the treatment. This was considered most essential, as even a small twig, if left untreated, would perhaps prove to be a new centre of infection and a means of re-spreading the disease through the orchard. One visitor stated that he believed that the first spraying should take place prior to pruning, so that the pests would not be afforded a safe refuge on the prunings, of which some small pieces might be left about.

To control these pests two sprayings are advisable—the first in May and the second in August, just prior to the bursting of the buds; but where this is impracticable, one good spraying should be given during the winter months. Even with war-time prices the cost does not exceed 6d. per tree treated, and for this modest expenditure the orchardist has the satisfaction of having clean trees and clean fruit.

Unlike the lime-sulphur spray, miscible oil does not choke the nozzle, neither is it injurious to the skin.

Mr. Browning stated that San José scale had made its first appearance in his orchard on trees that were planted in a slight hollow which in wet seasons was water-logged, and it had always been worst in drooping seasons when the trees were evidently suffering from the wet. The use of lime-sulphur spray for Black Spot on grapes was advocated, and one of the visitors said it was also very effective in checking Peach Aphis.

DEPARTMENTAL NOTE.—Instead of the batten referred to in the description of the apparatus used, the Department has found that a length of ¾-inch gas-pipe connected with the outlet end of the hose and the nozzle screwed on at the other end of the pipe at an angle of about 130 degrees much handier to use.

The Department has used lime-sulphur for many years, and has found that when strained before use it does not unduly clog the nozzles. When used at full winter strength and applied in a thorough manner it will control San José scale and also in the case of Peach Leaf Curl, thus doing two jobs in one operation.

In the case of Black Spot of grape vines it has been found that Bordeaux mixture is the more effective spray to use. The vines should previously be swabbed whilst dormant, just before the buds start, with either sulphuric acid solution or the combined sulphuric acid and sulphate of iron swab.

The Department has found tobacco wash (home made) or a commercial nicotine extract most effective in checking Peach Aphis.

On Saturday, 3rd August, Mr. W. Vickery gave an interesting and instructive demonstration of fruit-tree planting in the grounds of the Tingha Public School.

FRUIT-TREE PLANTING.

Preparation.—With an earth auger holes were bored to a depth of 3 feet, half plug of gelignite inserted and spread at the bottom of the hole by gentle ramming; a detonator with a length of fuse attached was then inserted in the other half plug, the fuse lighted, and the charge dropped into the hole, and a couple of shovelsful of soil thrown on and rammed. The resulting explosion effectively loosened the earth, rendering the removal of soil for planting an easy matter, and ensuring a looseness of texture that would enable roots to grow rapidly in all directions.

The two points of danger in the use of the explosive are—(1) too short a fuse, causing premature explosion—8 or 9 inches will be found ample; and (2) rough treatment of the detonator, which contains a powerful explosive, generally fulminate of mercury, which is liable to explode if roughly handled.

The detonator at first has a packing of sawdust on top of the explosive, and this requires removal, by gently shaking, before inserting the fuse, otherwise the charge will misfire.

Full instructions are given in a leaflet which is packed in every box of 5 lb. weight of gelignite, and if used according to those instructions there should be no danger. The cost of material—gelignite, fuse, and detonator—was about 3d. per hole.

Planting.—A general fault is to plant too deeply, bringing the graft below the surface of the soil, and causing roots to develop from the stem above the graft. As apple trees are grafted on some blight-resistant stock, such as Northern Spy, it follows that planting too deeply will cause development of non-resistant roots from above the graft, entailing almost endless work and worry; and, rooting too deeply, the plant loses the benefit of the air and food in the upper soil.

The centre of the hole requires to be slightly raised, so that the roots may be spread out in all directions and given a gentle slope downwards. It is a good idea to have the strongest root facing west, to brace the tree against prevailing winds. Any roots which have been injured in transplanting should be carefully trimmed with a knife—not secateurs—with the cut underneath. If the cut is on top there will, in all probability, be a dying back, thus enabling fungus diseases to gain entrance. The knife gives a sharp, clean cut, which will quickly heal, while the secateurs cause a slight bruising, which has a prejudicial effect on the root. Care must also be taken to keep the knife clean and dry, or else stain will result, and this has a bad effect too, the iron compound dissolved from the knife by the sap penetrating the root tissues and causing death. This is very likely to happen during damp weather. As the earth is being filled in a gentle shake or two will cause the soil to settle in around the roots, and the operation is finished off by tramping the soil to compact it sufficiently around the roots.

Pruning.—A young tree as received from the nursery usually carries too much wood, so that it requires to be shortened back. If a single stem, it is best to cut back to within 6 or 8 inches of the point from which the last growth has commenced, for, as a rule, it is here that the strongest eyes will be found, thus enabling the young tree to throw out fine, sturdy branches to build up a good framework. Should two or more branches be on the young tree, if well placed, they should be cut back to within 6 or 8 inches of the stem, but if badly placed it is much better to take out all except the best one, and to shorten it back as previously advised.

The ground around the trees should be kept well worked and free from weeds; and during the heat of summer, trees planted in sandy soil require mulching with bush scrapings, old straw, stable litter, &c., otherwise the young stem is very liable to be sunburnt owing to the glare from the sand.

Staking is not advisable, unless a tree shows a tendency to grow lopsided; in this case the tree should be given a decided lean or pull in the opposite direction by fastening to a stake until the barrel straightens. In windy weather see that the tree does not chafe against the stake. The label should also be removed; too often it is left on, and the tie injures the growing tree.

The following varieties were planted:—Granny Smith, Winter Pearmain, Quarrenden, Irish Peach, Rome Beauty, and Carrington.

DEPARTMENTAL NOTE.—With regard to the possible injury to the roots arising from the use of knives which are not kept clean, the Fruit Branch has not experienced root trouble through black stains on the knife blade.

At the meeting on 7th September the draft schedule for art and school work in connection with the 1919 Exhibition was approved, and arrangements were made for ladies to draft a schedule for the flower section. Mr. Yule was appointed to superintend the ring events.

Toronto.

At a meeting on 6th August the schedule for the forthcoming show was dealt with. Mr. Bennett gave a few hints on the cultivation of cucumbers, followed by a very interesting paper by Mr. H. Filmer on propagation.

United Peel River (Woolomin).

An interesting lecture was delivered by Mr. Woollett, Stock Inspector, on the diseases of stock, at a meeting on 17th August. The various diseases were explained by the lecturer, who impressed upon the members that extreme care was needed in connection with contagious diseases in stock, which should be reported to the nearest Stock Inspector as soon as suspected.

Valla.

A meeting was held on 5th August, when an interesting discussion took place on poultry-farming. Speakers pointed out that, with the railway connecting this district with the big southern markets, poultry-rearing would become a big factor in the growth of the district.

Wellington.

At a meeting held on 27th August papers were read by Mr. Kenyon on "Fruit-drying," and by Mr. B. S. Upton on "Incubating and Raising Chicks." Both gentlemen were heartily thanked for their most instructive papers.

FRUIT-DRYING.

This is an industry that deserves every encouragement, and it is difficult to see why it has not been gone into on a larger scale in this district. It takes very little trouble to carry out fruit-drying here as the climatic conditions are most favourable, and any artificial methods for drying the fruit, which is equal to any in the world, are not necessary. Before drying the fruit must be allowed to become perfectly ripe. Prunes are shaken off the tree in sheets or other suitable articles, but all other varieties of fruit must be picked carefully. To make ready for drying, make long rows of benches about 4 feet from the ground. My reason for making the benches 4 feet high is to keep the fruit free from dust. In imported dry fruits you often find them covered with particles of dust—this is due to the fact that they have been dried on the ground. Walking up and down the rows raises dust, and if the benches are high off the ground the drying fruit escapes it. Next you require wire trays to hold about half a case of fruit. These trays must have wooden frames because they have to be packed every night from the dew or rain. Have a large copper or boiler, according to the quantity of fruit you intend treating, filled with soft water. Twenty gallons of water will take ½ lb. of caustic soda. The water must be kept on the boil. Have a bucket or crate of fine wire netting to hold about half a case of fruit, and keep dipping the fruit until you find the skins cracking, then dip into cold water and when cold turn the fruit out into the trays, picking out all fruit not cracked. When the fruit is dry pack into boxes (butter boxes for preference). When the fruit begins to sweat, which is the worst time in fruit drying, keep turning the fruit. This only requires doing when the fruit is sweating.

The best prunes for drying are the little French varieties. The D'Agen is also a good prune for jam—½ lb. of sugar to 1 lb. of fruit. The Golden Drop prune dries well, as also does the Silver prune; but never have anything to do with Fellemberg, it is too sour and bitter. The best drying peach is the Elberta; apricot, the Hemskirk; fig, the Adriatic; and the Gordo Blanco grape for raisins. Dried prunes can be sold wholesale to any of the shops at 10d. per lb. All fruits should be slightly fumigated to keep out grubs. All the fruits I have mentioned grow well in this district.

In reply to question, Mr. Kenyon stated that the Wellington climate was one of the best for sun-drying fruit, and he exhibited some prunes dried over ten years ago, which were found to be as fresh as the day they were dried. He had no trouble with borers in the orchard. The ground was of sandy loam and retained the moisture. He said it was a pity someone did not go in for prune growing as it would pay well.

DEPARTMENTAL NOTES.—With regard to raising the benches 4 feet from the ground—while keeping the fruit free from dust during the process of drying is very important, the method suggested is somewhat cumbrous for drying on a large scale.

The Department uses special sweat boxes which are larger than butter boxes, for the purpose of "sweating" fruit.

Sulphur fumes for prunes are only recommended for light-coloured varieties like Golden Drop and Silver.

Woonona.

A well-attended meeting of this branch was held on 13th August, fully 100 members and intending members being present. The business of the evening consisted of a lecture by Mr. F. McMullen, B.A., on "Agricultural Education." The speaker dealt interestingly with the methods adopted by the Department of Education in instilling into the young minds the benefits to be derived from scientific agriculture, and pointed out that a good rural population was the backbone of any country. At the conclusion Mr. McMullen was accorded a hearty vote of thanks for his most instructive lecture.

Ten new members were admitted to the branch.

Orchard Notes.

OCTOBER.

W. J. ALLEN.

Cultivation.

OWING to abnormal seasons experienced lately it is not advisable to forecast the coming season; it would, however, be unwise to take the exceptionally wet conditions of last summer as a guide to the coming one. Growers should be prepared to meet drought conditions; they are then on the safe side, no matter what the weather happens to be.

All ploughing should have been completed last month, and the land should now be well worked with the cultivator, using the disc if green cover crops have been turned under, because this implement will not drag the unrotted vegetable matter to the surface. If no cover crop has been turned under, the spring-tooth or ordinary cultivator is suitable. The land should be frequently and deeply worked, both with and across the ploughing, so as to retain all the moisture possible during the hot summer months. By using special implements or extensions to the cultivators the land beneath the spread of the trees may be worked, and the weeds kept in check; by this means much hand labour will be saved, an important item in these days of high wages and scarcity of labour. It is essential that the land be worked as soon as it is in a fit condition after each fall of rain; by breaking the surface crust formed after rain, the capillary tubes are broken, and loss of moisture prevented.

On those orchards where washing of the soil occurs during thunderstorms or heavy falls of rain, it is advisable, after each cultivation, to run surface furrows with the plough across the fall of the land; this provision will carry off excess water and prevent much damage and loss of soil by scouring.

Newly-planted Citrus Trees.

Those who have failed to get all their young citrus trees planted should complete this duty as soon as possible, otherwise, unless water is available, some difficulty may be experienced in getting them established. Wherever possible newly-planted citrus trees should be mulched with farmyard manure, to conserve the moisture round the roots and keep the soil cool. All weeds which come up round the young trees should be kept down, otherwise they rob the soil of moisture required by the tree.

Should the season be dry, any newly-planted trees showing signs of wilting or lack of moisture should receive a couple of buckets of water, applied in a basin hoed round the tree, about 6 inches from the main stem. When this water has soaked away, the basin should be immediately filled in, and all the soil round the tree should be lightly loosened with a pronged hoe. Young trees should have the surface soil around them constantly and lightly stirred. Much injury is caused by allowing soil to cake round the stem of young trees, and by allowing the moisture immediately surrounding the roots to escape; this is a work that is often neglected. The stirring of the lands between the young trees with the cultivator is not sufficient, because their root systems do not, at this stage of growth, reach out under the cultivated area.

Young trees planted in exposed areas, where the winds are severe, should be carefully staked and tied, placing the stake on the side from which the prevailing winds blow. The constant swaying about of young trees prevents the roots from establishing themselves firmly, and often the stem of the young tree is seriously injured by friction with soil set hard round them, causing collar rot and other troubles.

Much useful work may be done by going over all newly-planted trees during the spring and early summer months, and rubbing off useless and excess growths, and throwing the energy of the tree into right directions. A little time given to this work will repay itself in the building up of strong, shapely trees. Experience has demonstrated that it is not wise to nip back those shoots required to form the newly-planted tree, because the growth becomes too bunchy, and has to be thinned out later. It is best to throw the growth into permanent leaders.

Spraying.

The experience of last summer renders it advisable to keep the spray-cask constantly in use during this month and the next. We do not know what climatic conditions are in front of us, but we do know that Black Spot, Mildew, Leaf Curl, and Shot Hole were very bad last season; no grower can afford to take any chances, because the spores of fungus are ready to develop directly suitable weather conditions appear. Owing to the wet interfering with the spraying, many larvæ of codlin moth escaped, and every effort should be made to destroy the first brood of caterpillars.

Spraying is a costly and troublesome orchard work, but it is essential; it should be looked upon as an insurance. The cost of spraying is small when compared with the loss suffered by its omission.

Black Spot of the Apple and Pear.—Most growers will endeavour to follow out the instructions given in the September issue, using either lime and sulphur or Bordeaux mixture. The early-flowering apples and pears will already have had the "pinking" stage application, and will now be ready for the second application as the petals fall, followed by the third and, perhaps, more applications. The later-flowering varieties must receive the same prompt treatment.

Apple Mildew.—The Department is continuing its experiments in connection with this serious disease. It is advised to treat the trees with either the sulphide of iron wash or atomic sulphur.

Codlin Moth.—As already stated, owing to the exceedingly wet weather seriously interfering with spraying operations last season, codlin moth was very bad in some localities, and many caterpillars escaped. This means that we must expect codlin to be troublesome this season; and every effort must be made to cope with the danger. The first spraying with arsenate of lead must be applied promptly, as the petals fall, followed by the second, third, and fourth sprayings. As arsenate of lead is becoming more difficult to obtain, under war conditions, the following table is republished, in order that orchardists may be enabled to utilise any of the brands of arsenate of lead which may be on the market. The table has been compiled by the Chemist's Branch, to which samples have been submitted for analysis.

TABLE showing weight of various brands of lead arsenate paste to be taken in order that the resulting mixture shall contain as much dry lead arsenate as is equivalent to "18 oz. of arsenate of lead in the dry state to each 50 gallons of water."

Brand.	Weight to be taken. lb. oz.	Brand.	Weight to be taken. lb. oz.
Swift's	2 0	Hemmingway	2 0
Electro	1 11	Sherwin Williams	2 6
Foster's	2 11	Lewis Berger	2 0
Blue Bell	2 2	Federal	2 3
Red Seal	4 3	Austral	1 9
Nichol's or Our Jack	1 14	Carlton	2 5
Platypus	3 6	Vallo	1 14

The success of the method is unquestionable. It has been proved time and again that those who spray systematically, bandage the trees, and pick up and destroy all fallen and infested fruit, succeed in harvesting over 90 per cent. of clean fruit.

Experiments should be carried out with the calcium arsenate. This should prove a cheap and valuable spray for codlin moth and leaf-eating insects.

Black and Green Aphis.—During this month these pests are likely to give trouble. They should be treated with strong tobacco washes, using as high a pressure as possible in the spray hose, so as to penetrate in and amongst the foliage.

Pear and Cherry Slug.—Wherever this pest makes its appearance the trees should be immediately sprayed with arsenate of lead, at the same strength as that recommended for codlin moth.

Woolly Aphis.—All careful growers will have treated apple-trees for this pest at least once during the winter. Woolly Aphis is becoming very prevalent throughout Australia, due, it is considered, to the wet summers we have experienced during the past few years. It will be necessary to spray during the spring and summer to keep aphis in check, using strong tobacco washes. Motor pumps give the best results, using a pressure of 200 lb., more especially during the summer, owing to the force with which the spray may be delivered. Much good may be done by what is known as "spotting," *i.e.*, following up the spraying with concentrated washes, applied with a small paint-brush. Many knot holes, crevices, close forks, &c., where the spray has not penetrated may be cleansed by applying the wash direct to these parts with a brush.

Peach Tip Moth.—This pest is becoming very prevalent in the Cumberland district, and as it is likely to spread further afield, growers should use every effort to suppress it. Large numbers of the pupæ have carried over from last season; these will now be breeding out, and if not destroyed they will produce an enormous number of moths for the second brooding, resulting in heavy loss to the stone-fruit growers.

Spraying is not too successful, because the tips of the shoots grow away so fast from the spray, rendering it almost valueless unless applied so frequently as to render the work practically impossible for the average grower to carry out. The best treatment, although irksome and costly, appears to be the nipping off of the affected tips when they are seen to be drooping, and burning them. Such a large number of the first brood may be destroyed by this means that the result will fully repay the time and expense. This is provided that one's neighbours will do likewise, and not breed up the moth by neglect, and so reinfest adjoining properties.

Oidium.—Wherever this mildew of the grape is liable to appear the vines must be treated every week or ten days with very fine dry sulphur, applied with either a sulphur bellows or a sulphuring outfit; failing either of these appliances, the sulphur should be dusted over the vines, using a bag of fine muslin or other similar suitable material.

Black Spot of Vine.—Growers suffered so severely from this fungus trouble last season that undoubtedly they have taken the precaution to swab their vines, as recommended in these notes last month. This must be followed by spraying with Bordeaux mixture (6—4—50 formula), just as the buds burst, again just before flowering, and again after the fruit sets.

Vine Moth.—Where the caterpillar of this moth is making its appearance it is recommended to spray the vines with arsenate of lead, at the same strength as already recommended for codlin moth.

Dormant Buds and Grafts.

Keep all worked stock well disbudded, so as to permit the bud or graft to get the full benefit of the sap. If any bud or graft has failed, encourage a strong, suitably-placed shoot to grow in its place; this may be budded as soon as strong enough, and will be little behind those which did not fail. Any budded stock which has not already been so treated should be cut back without delay. Older trees which were reworked will require watching. When the shoots are 18 inches long they should be nipped back, so as to strengthen and cause them to branch. If this is done they are not so seriously injured by winds, and the new formation is quickly built up.

Thinning Fruit.

Provided the weather conditions continue good, there is every indication of a heavy stone-fruit crop, and, in such case, growers should judiciously thin the crops wherever they have set too heavily to give fine marketable fruit. This work should not be done till after the natural drop of unfertilised fruit has taken place, otherwise the crop may be thinned too severely. In thinning, growers must be governed by the variety and their own local conditions of soil and climate. No hard-and-fast rule can be laid down.

Irrigation.

The good rains which fell in most of the irrigated areas during August rendered it unnecessary to irrigate in many orchards during September, but with the approach of hot weather, every attention must be given to keeping up the moisture in the soil. Care and judgment must always be exercised in applying water to fruit-trees. Apply water only when necessary, and cultivate freely. Much better results will then be obtained.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
Hay P. and A. Association	G. S. Camden ...	Oct. 9, 10
Bathurst A., H., and P. Association (Spring Show) ...	S. V. Turrell ...	,, 19
Millthorpe A. and H. Association	C. J. E. Hawken	,, 23
Quandialla P., A., H., and I. Society...	N. Conn	,, 23
Tweed River A. Society (Murwillumbah)	T. M. Kennedy ...	Nov. 13, 14
Lismore A. and P. Society	H. Pritchard ...	,, 20, 21
1919.		
Albion Park A., H., and I. Association	H. G. Fraser ...	Jan. 15, 16
Kiama Agricultural Society	G. A. Somerville...	,, 25, 27
Dapto A. and H. Society	F. James ...	,, 31; Feb. 1
Berry A. Association	W. Pryor ...	Feb. 5, 6
Shoalhaven A. and H. Association (Nowra)	H. Rauch ...	,, 13, 14
Manning River A. and H. Association	L. Plummer ...	,, 19, 20
Ulladulla A. and H. Association (Milton)	R. F. Cork ...	,, 19, 20
Coff's Harbour and District A. Society	C. Vost	,, 20, 21
Yanco Irrigation Area A. Society (Leeton)	T. H. Hogan ...	,, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent ...	,, 25, 26, 27
Inverell P. and A. Association	J. T. Dale ...	,, 25, 26, 27
Dorrigo and Guy Fawkes A. Association	R. R. Blair ...	,, 26, 27
Newcastle A., H., and I. Association	E. J. Dann ...	,, 26, 27, 28; March 1
Bathurst A., H., and P. Association	S. V. Turrell ...	Mar. 4, 5, 6
Tenterfield P., A., and M. Society	R. S. Smith ...	,, 4, 5, 6
Tumut A. and P. Association	T. E. Wilkinson ...	,, 5, 6
Bangalow A. and I. Society	W. H. Reading ...	,, 11, 12
Cootamundra A., P., H., and I. Association	N. Gardner ...	,, 11, 12
P. and A. Assn. of Central New England (Glen Innes)	G. A. Priest ...	,, 11, 12, 13
Kangaroo Valley A. and H. Association	L. W. Vance ...	,, 12, 13
Nambucca A. and H. Association	M. Wallace ...	,, 12, 13
Goulburn A., P., and H. Society	H. C. Fraser ...	,, 13, 14, 15
Tumbarumba and Upper Murray P. and A. Society...	W. R. Figures ...	,, 14, 15
Mudgee A., P., H., and I. Association	E. J. Hannan ...	,, 18, 19, 20
Armidale and New England P., A., and H. Assocn....	A. McArthur ...	,, 18, 19, 20, 21
Cobargo A., P., and H. Society	T. F. Kennelly ...	,, 19, 20
Crookwell A., P., and H. Society	P. R. Marks ...	,, 19, 20
Gundagai P. and A. Society	C. D. Asprey ...	,, 19, 20
Macleay A., H., and I. Association (Kempsey) ...	E. Weeks... ...	,, 19, 20, 21
Cooma P. and A. Association	C. J. Walmsley ...	,, 26, 27
Hunter River A. and P. Association	E. H. Fountain ...	,, 26, 27, 28, 29
Camden A., H., and I. Society	A. E. Baldock ...	April 2, 3, 4
Dungog A. and H. Association	W. H. Green ...	,, 2, 3, 4
Quirindi District P., A., and H. Association	A. Pountney ...	,, 2, 3, 4
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins ...	,, 9, 10
Royal Agricultural Society of N.S.W.	H. M. Somer ...	,, 15–23
Moree P. and A. Society	A. U. Ezzy ...	May 21, 22, 23
Murrumbidgee P. and A. Association (Wagga) ...	A. F. D. White ...	Aug. 26, 27, 28

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. . THE . .

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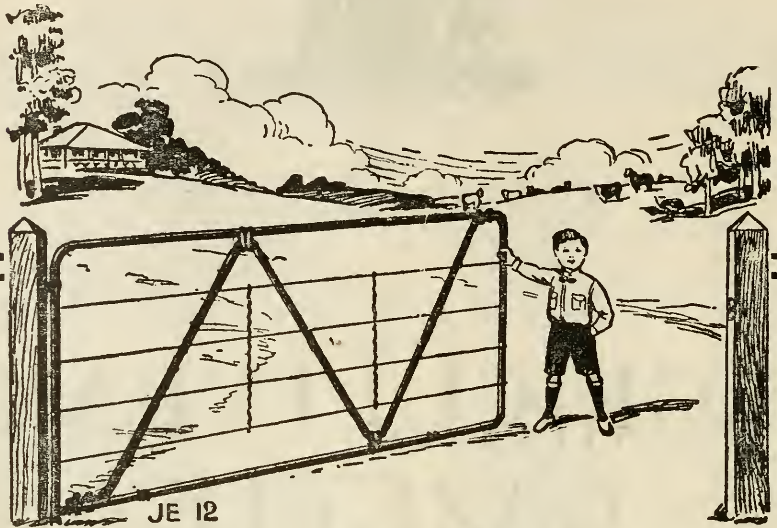

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2nd November, 1918.

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FIELD TESTS

Held at Werribee on 19th and 20th September last disclose the efficiency of

JELBART'S CRUDE OIL TRACTOR

Whether judged from the viewpoint of the amount of ground worked in a given time or the fuel consumption per acre, the following extract shows that in actual operation JELBART'S CRUDE OIL TRACTOR is easily first.

[*Extract from Age, Sept.* 26*th*, 1918.]

Motor Tractor Ploughing.

A preliminary report of the motor tractor ploughing held at Werribee on the 19th and 20th inst., has been handed to the secretary of the society. The total time taken up in ploughing includes turning at each end, but not delays due to accident stoppages. Further tests are to be made at the University Engineering School next week.

The result is as follows :—

Competitors.	Acres ploughed.	Ploughing time.	Total fuel.	Total water.	Acres per hour.	Fuel per acre.
		hours.	gals.	gals.		gals.
Crude Oil Tractor, Jelbart Pty., Ltd.	3·57	2·82	6·26	6·85	1·27	1·75
Bates Steel Muel. Clutterbuck Bros.	3·50	3·67	9·30	8·07	0·95	2·66
Imperial E.A.A., McDonald & Co.	3·54	3·78	10·94	4·62	0·94	3·10
Sunshine O., H. V. McKay	3·63	4·45	7·73	15·60	0·82	2·13
Imperial, Lightweight, McDonald & Co.	2·12	3·11	5·27	5·25	0·68	2·49
Mogul, International Har. Co.......	2·82	4·50	12·06	10·61	0·63	4·28
Sunshine A, H. V. McKay	1·79	4·69	5·40	9·09	0·38	3·02
Waterloo Boy, Mitchell & Co. ...	1·40	4·69	7·58	0·55	0·30	5·41

RELATIVE COSTS.

The foregoing conclusively proves that both for speed with which work is performed and economy of fuel consumption the JELBART TRACTOR in open trial beat all competitors.

The JELBART TRACTOR will operate on Kerosene or Crude Oil.

Consuming Kerosene, which was the stipulated fuel in the above contest, at 2s. per gallon, the JELBART TRACTOR ploughed an acre at the cost of 3s. 6d.

The next nearest competitor would consume 5s. 3¾d. worth of Kerosene to do the same amount of work.

In respect of speed, the JELBART TRACTOR ploughed nearly one-third of an acre per hour more than any other engine. This means a gain of three acres for every working day of ten hours.

Had the JELBART TRACTOR been allowed to burn Crude Oil as fuel the difference would have been still more marked, as the fuel cost would then have been only 1s. 10½d. per acre.

Crude Oil fuel is a special feature of the JELBART TRACTOR and reduces operating cost to a minimum.

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AND AT MELBOURNE AND BRISBANE.

Vol. XXIX. Part 11. NOVEMBER 2, 1918.

Agricultural Gazette of New South Wales.

The Cultivation of Maize.

[Continued from page 704.]

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

Kind of Cultivator to Use.

The use of the harrow or the weeder has already been specially referred to at length as the most desirable implement for the first cultivation of the growing crop.

The mouldboard plough as a cultivating implement is rapidly passing into disuse with the best maize growers. In some old conservative centres this type of plough is used to do the whole of the cultivation, a hill being thrown to the rows and the following rounds backing up, leaving a clean-out furrow in the middle between the rows. The cost of such a method of cultivation puts it at once out of consideration, except on small areas, and except where a very light plough is used. Even here it is only justifiable when grass and weeds have become too large to be killed by ordinary tillage, which should only occur when a considerable spell of rainy weather occurs soon after planting, or during the young growth.

On the North Coast the disc cultivator is rapidly coming into favour as one of the most valuable implements in the maize crop. One type (of which an illustration is shown in Fig. 3) can not only be converted into an ordinary disc harrow by reversing the discs, but the frame can be raised to straddle the rows, and cultivate maize up to 3 feet or 3½ feet in height. The discs can also be set at any angle for dealing with weeds, for compacting light or cloddy soils, and the inner discs may be raised for shallower cultivation closer to the plants. It is especially valuable, also, for dealing with weeds which have got beyond the control of the ordinary cultivator, which is more or less unavoidable in wet seasons. Another distinct advantage possessed by this implement is that it will throw a smothering layer of earth into the rows to cover the weeds adjacent to the stalks (which are always the most difficult to deal with) without disturbing the roots close to the plants, and without cultivating deeply, as the mouldboard plough does when used for this purpose. The practice of throwing a furrow away from each side of the row with the mouldboard plough is not seen so much nowadays; but if it is thought advisable to warm up the soil near the roots in this way, and then throw the soil back again later, this work can be well performed with this type of disc-cultivator. This implement deals more effectively with ordinary weeds than with summer grass, paspalum, couch, or water couch in the maize crop. In another type of disc cultivator with wheels the depth can be regulated more easily.

For dealing more effectively with these grasses, two types of cultivator are illustrated in Figs. 4 and 5, which are an improvement on the spring-tooth cultivator, the teeth of which jump out of the ground on meeting a tuft of grass with a firm hold in the soil, while the rigid teeth of these implements will tear it out. One of these cultivators will work two rows at once if they are not too far apart. A larger implement still of similar type is now obtainable, which straddles two rows at a time, and requires three horses, but seems somewhat bulky and clumsy, and is probably only worth consideration on very large areas.

With these days of high cost of production, the old practice of hand-hoeing in the crop is practically doomed unless under special circumstances. To a large extent the necessity for the costly process of hand-hoeing can be obviated by harrowing the young crop, and by the method of planting on the square, and cultivating in two directions.

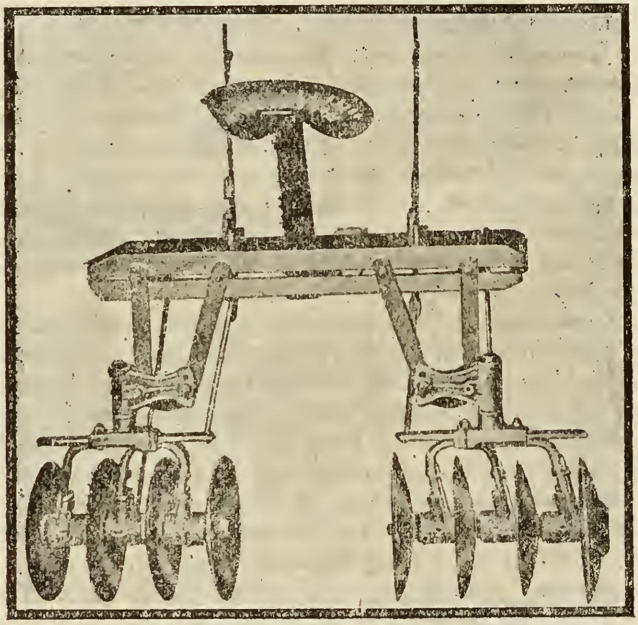

Fig. 3.—A type of Disc Cultivator with raised frame and reversible discs which can be easily converted into a disc harrow.

The surface cultivator has been already described.

Single-horse cultivators are, of course, valuable on small areas, and also for late cultivation of the crop. They are also practically necessary on stumpy land.

Hilling.

The practice of hilling maize is one that deserves more consideration than is usually given to it. It is felt that it is in many cases applied because of long custom without inquiring into the reason for it, or its effect on the crop.

The following advantages may be claimed for hilling :—

1. It acts as a mechanical support to the stalks.
2. It prevents to some extent the formation of suckers, the growth of which is thought by many to lower the yield of the grain crop, especially in a dry climate.

3. It smothers a large number of weeds in the rows which are otherwise difficult to deal with by cultivation implements.

4. It acts as a bank for the sides of water furrows in irrigation districts, and prevents the water coming into contact with the stalks (as should not happen in irrigation).

5. It serves a useful purpose in drainage on low-lying lands in wet seasons.

On the other hand, the following disadvantages or objections may be urged against it:—

1. It exposes a greater surface of soil for evaporation—which is a factor to be considered in dry districts or in dry seasons.

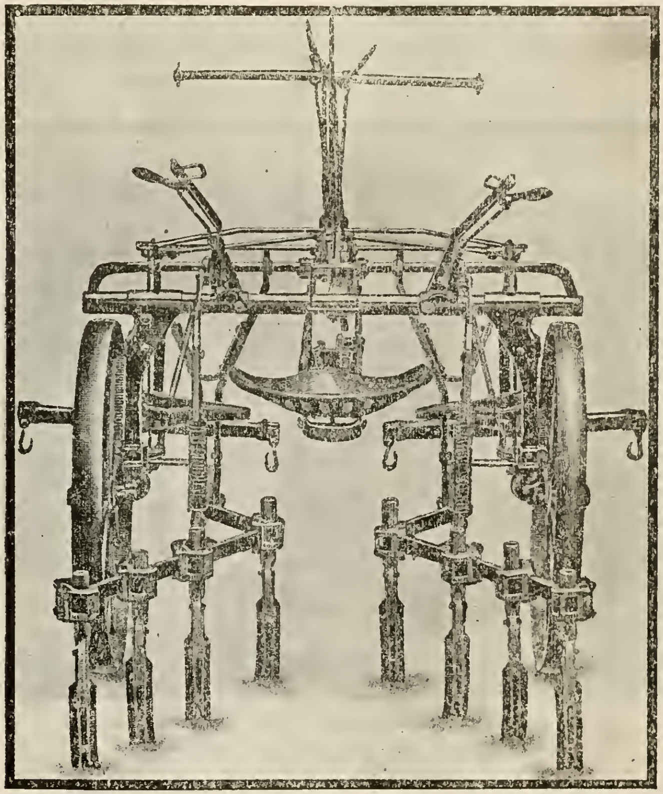

Fig. 4.—A Two-row Corn Cultivator, with rigid tines, suitable for dealing with stubborn grass.

2. Later cultivation partly removes the hill, and exposes a number of feeding roots.

3. On shallower soils a good hilling exposes too much subsoil.

4. On hill slopes much damage by washing is likely to be caused if the hilling is done in the direction of the slope.

5. When hilling is done with the plough (especially a heavy one) there is a danger of severe root pruning. The disc cultivator does less damage because it works at a shallower depth, and further from the stalks. Lodging (to avoid which hilling is especially carried out in many cases) may often be caused by cutting through the main roots by the plough.

6. Some cases have been observed in which the extra rigidity given to the stalks by hilling has the effect of causing the snapping of the stalks in a heavy wind.

7. At the time when hilling is usually done (*i.e.*, when the plants are 18 inches to 2 feet high) plants inclined to lodge will readily pick up in later growth, whether hilling is done or not.

8. Deep and thorough preparation of the seed-bed will prevent a good deal of lodging, and render hilling unnecessary, when it is done for this purpose alone.

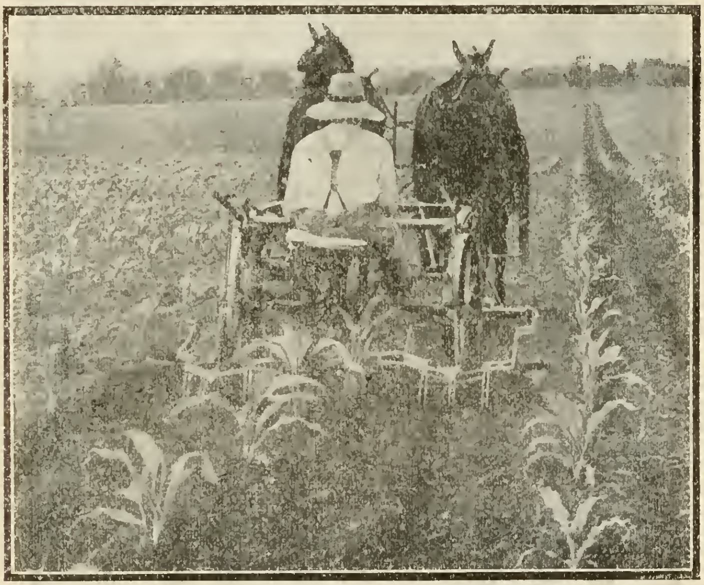

Fig. 5.—Two-row Corn Cultivater for two horses, in operation.
(From "The Corn Crops," by E. G. Montgomery.)

9. Harrowing the growing crop will destroy a large number of young weeds in the rows, and render hilling unnecessary for this purpose.

The best advice that can be given is for the farmer to use his discretion, basing his decision on sound reason, according to his conditions. There are times when hilling is very detrimental to the crop, and there also may be occasions when hilling is absolutely necessary. It is thought, however, that hilling (especially with the plough) is done in far too many cases where it is not warranted.

There is considerable difference between throwing a light covering into the rows to cover up small weeds, and making a big ridge. A small hill can be given with less damage by the disc cultivator, or with mouldboard sweeps on the single or two-horse cultivator. It should be noted that hilling in loose or cloddy ground will have little effect in smothering suckers or troublesome grass and weeds.

Experiments carried out in Mississippi* have given the following results:—

		1911.	1912.	
Flat cultivation	...	39·8	44·5	bushels per acre.
Ridged cultivation	...	31·5	29·2	,, ,,

Removal of Suckers.

The chief causes of suckering in the maize crop are rich soil and abundant moisture. Maize suckers more freely on rich alluvial flats than on moderately fertile upland soils. There is also some degree of difference between varieties. The flint, soft flour, sweet, and popcorn varieties sucker very profusely in comparison with the Dent varieties; but of the latter, Hickory King and Leaming, of the types grown in this State, sucker more abundantly than most others.

A thin stand induces more sucker formation, but this can be put down to the fact of the plants having more moisture and plant-food material to draw upon. Good cultivation is also responsible for more suckering for the same reason.

There seems to be something yet unexplained about the formation of suckers, for, while on the one hand practical farmers know that under ordinary conditions maize that suckers will in most cases give a good grain yield, on the other hand, when the growth of the main stalk is injured or depressed in any way, there is a tendency to the development of suckers. The prevention of suckers to some extent by hilling and by "hill" planting, has previously been referred to.

The question as to whether suckers should be removed from the crop is one which is of more importance. The removal of suckers is a practice that is carried out by many experienced farmers in the belief (though, perhaps, not always with this object alone) that they draw nourishment away from the main stalk which bears the ear, and therefore detract from the yield. True, it is found that sometimes the suckers bear small cobs, but when this occurs it is usually the fault of sowing too thinly for the fertility of the soil.

Even allowing for the fact that good use can be made of the suckers which are removed, in feeding them to cattle, the cost of the work is an item to be considered. In a heavily suckering crop, ½ or 1 acre would be a good day's work, and under most conditions the amount of fodder obtained would not justify the operation at this cost.

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* Mississippi Agr. Exp. Station Bulletin 170 (1915).

The effect on yield is the most important consideration, and the results of experiments up to the present by no means justify the practice.

At Bathurst,* on river flat soil, the following results were obtained in the season 1916–17, with a rainfall of 16½ inches during growth :—

Unsuckered...	85·06	bushels per acre.
Suckered ...	64·10	" "

In Mississippi† the results of suckering were as follows :—

	1910.	1912.	
Unsuckered	37·8	40·5	bushels per acre.
Suckered	29·4	38·5	" "

The difference between the two plots would not be expected to be so great in a dry season, but it seems unlikely that even then there would be a big difference in favour of removing the suckers.

On the whole it may be stated that the removal of suckers as a means of increasing the yield of maize has been seriously over-estimated by many experienced farmers in this State, whatever theoretical reasons may be advanced in its favour. The practice is most largely adopted on the South Coast.

Detasselling.

Detasselling has been put forward also by some farmers as a method of increasing the maize yield, whilst others have maintained that there is a loss in yield, or practically no difference from its use.

The question needs consideration from two viewpoints :—

1. Will detasselling (of alternate rows) lower the yield of the rows detasselled ?

2. Will seed from detasselled rows give a higher yield than from undetasselled rows ?

Experiments have shown that there is a slight loss in yield, at times quite negligible, but sometimes up to about 10 per cent., in rows which have been detasselled, as the result of this operation where the rows are of the same variety. This is probably due to the fact that there is a certain amount of self-pollination in maize. Detasselling ensures that the pollen comes from the neighbouring rows.

The second part of the question is answered by the fact that the crossing of unrelated strains, or types, as represented by different ears in a variety, is the basis of the evolution of an improved yielding strain. This is especially the case when the rows detasselled are high yielding rows from a single ear or ears of known producing capacity, and the neighbouring undetasselled rows are of proved high-yielding capacity. Where the detasselled rows in the field are of unknown pedigree, it is possible that seed from them will be of slightly better yielding capacity than normal, but it cannot be relied upon in this respect, and "what is worth doing is worth doing well."

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* *Agr. Gazette of N.S.W.*, December, 1917.

† Mississippi Agr. Exp. Station Bulletin 170 (1915).

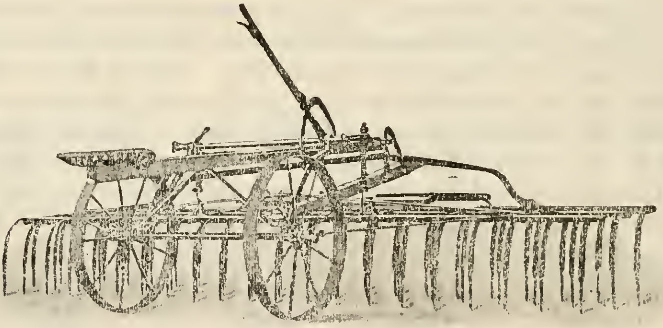
Topping and Stripping.

The topping of maize (*i.e.*, cutting the stalk above the cob for the sake of the fodder after the grain has begun to set) is a practice that is seen to some extent in the Tumut district. It is considered not to have much effect on yield, but is known to induce slightly earlier maturity.

In Mississippi* topping decreased the grain yield 20 per cent. in an average of three years, and although it was considered to give a much better quality of fodder than is obtained by harvesting the whole stalk for fodder, the yield of fodder was light, and the injury to the grain yield greater than the value of the fodder secured, and the considerable labour involved.

In Alabama† topping decreased the yield 2 bushels per acre in a four-year average. The yield of fodder "topped" was about 4½ cwt. per acre.

Stripping the leaves from the stalks after the cobs have formed is common in the southern United States and many other tropical maize-growing countries, where the leaf-blades are highly valued as fodder. It does not give much more fodder than topping; and although the quality of the fodder is good if done early, the practice is of doubtful economy owing to the yield of grain being affected, while if done late the fodder secured is of but little value.



The "Weeder." An implement used largely in the United States of America for harrowing the growing maize crop. Cultivates three rows at a time.

(From the "Corn Crops," by E. G. Montgomery.)

TENTH ANNUAL CONFERENCE OF DAIRY FARMERS.

A REPORT of the Tenth Annual Conference of Poultry Farmers, which was held at the Hawkesbury Agricultural College, Richmond, N.S.W., on 15th June, 1918, has been issued as Farmers' Bulletin No. 120, and may be obtained by bona fide poultry farmers free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

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* Mississippi Agr. Exp. Station Bulletin 33.

† Alabama Agr. Exp. Station Bulletin 134 (1905).

Wheat Variety Trials, 1917-18.

WOMEN'S TRAINING FARM, COWRA.

M. H. REYNOLDS, Manager,* and H. LITTLE, Assistant Experimentalist.

[The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that the following results only refer to one year, and cannot therefore be considered as in any way final. The climatic conditions were somewhat unusual, and varieties which, under normal conditions, are satisfactory, suffered by comparison with others. It is felt that, though no conclusions can be drawn from the one year's results, the figures are of sufficient interest to warrant publication at this stage.]

THE scheme of farming adopted on the experiment area embraces a two-course rotation—wheat one year, fallow or fodder crop in the alternate year. The land was sown with experiments in 1915, left in stubble till October, 1916, then ploughed 5 inches deep, and bare fallowed till the autumn sowing in 1917.

The soil is a sandy to clay loam, granitic in origin, with good clay subsoil.

The season was rather abnormal, with unseasonable conditions prevailing during January and February. Then dry weather set in, continuing till early in May. The great evaporation dried out the soil till ploughing became impossible, and the sowing period was delayed. Early in May, cold, showery conditions set in. The rain was light, but it made cultivation operations possible, and germinated the seed already sown. Not till mid-June did beneficial rains come, and after this, abnormally wet conditions prevailed till early December. Good dry weather was experienced for the grain harvest. The frosts were light, and the amount of damage caused by frost was remarkably small.

Rainfall.—Total for the year, 28·94 inches, made up as follows:—

January ...	220 points.	July	327 points.
February ..	237 ,,	August ...	399 ,,
March ...	60 ,,	September ...	272 ,,
April	98 ,,	October ...	399 ,,
May	126 ,,	November ...	281 ,,
June	303 ,,	December ...	172 ,,

Diseases.—The dryness of the early autumn and moist character of the winter and spring seemed to favour the development of fungus diseases to a very unusual degree. Flag smut (*Urocystis tritici*) was prevalent in Hard Federation, in one paddock, to an unprecedented extent. Take-all (*Ophiobolus graminis*) was prevalent in all varieties and in all localities in small patches and individual plants, but was severe in the Federation sown in May. Rust (*Puccinia graminis* and *P. triticina*) did a great deal of damage. This disease showed a preference for some varieties, while others were nearly unharmed. The field crop of Commonwealth was practically ruined. Late-sown varieties suffered much more than the early-sown ones. The effects of rust attacks on the grain was very noticeable. Mildew (*Erysiphe graminis*) was slight, but nevertheless present. Wheat blight was associated with rust in the crop of Commonwealth already mentioned, and helped in its destruction.

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* Now Controller of Animal Industry, Department of Lands.

Insect Pests were not troublesome, though cutworms, pumpkin beetles, and brown bugs were present at harvesting time.

Weeds appeared in troublesome numbers, each in its season. Fumitory (*Fumaria officinalis*) came first in winter. Shepherd's Purse (*Capsella Bursa-pastoris*), Barley grass, and Trefoil were also noticeable.

Object of the Experiment.

The object is to determine the most suitable varieties for hay and grain in the Cowra district. Four sections are sown, viz.—(1) Early sowing, fed-off; (2) Early sowing, not fed-off; (3) Mid-season planting; (4) Late planting. Twenty varieties were tested, the plan being re-arranged from that of the previous year.

Rate of Seed and Manure.—In the early-sown portion, seed was applied at the rate of 42 lb., and for mid-season and late sections at 80 lb., per acre. All seed was treated with bluestone, 1½ per cent., and lime-water, as a fungicide. Superphosphate was uniformly applied at the rate of 56 lb. per acre.

The germination of early plantings was uneven; some seed germinated almost immediately, while a percentage did not germinate till mid-May. The mid-season and late sections germinated satisfactorily.

Date of Seeding.—Early sowings, 23rd and 24th April; mid-season, 14th and 17th May; late, 20th and 21st June.

Feeding-off.—Sections 1 (Early Planting—fed-off) and 3 (Mid-season Planting) were fed-off on 7th, 8th, and 9th July. The growth of section 3 was forward, and feeding-off was considered necessary.

Bird Pests.—Sparrows played havoc with the first varieties to ripen, reducing their yield by about one-third; the plots so affected were Bunyip, Clarendon, Canberra, Improved Steinwedel, and Firbank in sections 1 and 2, those in section 2 being worst affected.

Uneven germination.—Plots of Clarendon, Firbank, and Canberra, in sections 1 and 2, were extremely thin, due to faulty seed; Roseworthy, in section 3, was also very thin.

Penny Wheat.—This is a promising variety from Victoria; it stood well, produced a good sample, grows about 3 feet 6 inches high; and produces a good coloured hay, very much like Dart's Imperial. Yielded, from a plot of ·95 acre area, 17 bushels of fair size and fairly plump grain. It was slightly affected by rust, and some flag smut was noticed. It strips and threshes well and easily.

TABLE I.—Showing the Grain Yields of the Wheat Variety Trials, Women's Training Farm, Cowra, 1917–18.

Plot No.	Variety.	Early Planting—Fed-off.			Early Planting—Not Fed-off.		
		Acre Yield.		Percentage.	Acre Yield.		Percentage.
	A Section.	bus.	lb.		bus.	lb.	
1 (*check*)	Hard Federation	15	24	100	10	43	100
2	Bunyip	14	34	98·1	10	27	83·2
3	King's White	15	7	105·7	17	52	124·2
4 (*check*)	Hard Federation	13	45	100	16	13	100
5	Marshall's No. 3	15	24	101·2	21	20	125·8
6	Zealand	11	0	65·9	15	7	85·4
7 (*check*)	Hard Federation	18	9	100	18	25½	100
8	Yandilla King	17	36	104·5	18	25½	98·5
9	Roseworthy	15	7	96·2	25	18	115·8
10 (*check*)	Hard Federation	14	34	100	19	15	100
11	Warden	16	46	109·5	29	58	145·5
12	Federation	11	49	72·9	19	15	87·5
13 (*check*)	Hard Federation	16	46	100	23	20	100
14	Currawa	17	19	102·1	28	55	124
15	Commonwealth	7	42	50·9	16	55	82
16 (*check*)	Hard Federation	14	18	100	19	15	100
	B Section.						
1 (*check*)	Hard Federation	18	9	100	13	12	100
2	Firbank	26	57	127·8	8	15	56·8
3	Clarendon	29	9	121·3	12	39	80·2
4 (*check*)	Hard Federation	26	57	100	17	3	100
5	Rymer	24	45	93·1	20	21	120·6
6	Warren	17	21	66·1	19	15	115·3
7 (*check*)	Hard Federation	25	51	100	16	30	100
8	Major	21	20	87·6	13	12	79·5
9	Cowra No. 15	18	42	81·9	16	46	100·5
10 (*check*)	Hard Federation	21	20	100	16	46	100
11	,, ,,	22	0	104·7	14	51	91
12	Canberra	29	42	143·7	12	39	84
13 (*check*)	Hard Federation	20	21	100	15	24	100
14	Bomen	26	24	142·5	20	21	144·1
15	Improved Steinwedel	19	48	126·2	8	48	68·5
16 (*check*)	Hard Federation	14	51	100	11	33	100

Plot No.	Variety.	Mid-Season Planting.			Late Planting.		
		Acre Yield.		Percentage.	Acre Yield.		Percentage.
	A Section.	bus.	lb.		bus.	lb	
1 (*check*)	Hard Federation	14	52	100	....		....
2	Bunyip	29	12	185	....		....
3	King's White	23	2	137·6	8	48	113
4 (*check*)	Hard Federation	17	40	100	8	15	100
5	Marshall's No. 3	21	0	128·3	10	27	120·1
6	Zealand	13	42	91·2	6	19	68·9
7 (*check*)	Hard Federation	13	42	100	9	37	100
8	Yandilla King	17	30	116·4	11	0	116·6
9	Roseworthy	16	37	100	10	10	109·9
10 (*check*)	Hard Federation	18	5	100	9	4	100
11	Warden	18	5	88·9	11	0	105·2
12	Federation	21	35	95·5	7	9	60·5
13 (*check*)	Hard Federation	26	50	100	13	12	100
14	Currawa	28	55	103·3	13	28½	107·3
15	Commonwealth	17	30	60·0	4	24	36·9
16 (*check*)	Hard Federation	30	20	100	11	16	100
	B Section.						
1 (*check*)	Hard Federation	13	12	100	14	35	100
2	Firbank	21	20	138·4	14	0	109·9
3	Clarendon	25	51	140·2	18	5	166·1
4 (*check*)	Hard Federation	20	54	100	9	2	100
5	Rymer	17	3	82·3	9	20	85·7
6	Warren	25	18	123·0	15	45	117·8
7 (*check*)	Hard Federation	20	21	100	13	25	100
8	Major	14	18	68·4	7	35	56·5
9	Cowra No. 15	17	19	80·7	9	55	73·9
10 (*check*)	Hard Federation	22	0	100	13	25	100
11	,, ,,	22	0	102·5	16	55	120·8
12	Canberra	33	0	157·9	22	27½	153·9
13 (*check*)	Hard Federation	20	21	100	15	10	100
14	Bomen	22	0	109	18	22½	125·8
15	Improved Steinwedel	20	54	104·5	16	20	116·3
16 (*check*)	Hard Federation	19	48	100	14	17½	100

TABLE II.—Showing Hay Yields of the Wheat Variety Trials, Women's Training Farm, Cowra, 1917–18.

Plot No.	Variety.	Early Planting—Fed-off.					Early Planting—Not Fed-off.				
		Acre Yield.				Percentage.	Acre Yield.				Percentage.
		t.	c.	q.	lb.		t.	c.	q.	lb.	
	A Section.										
1 (*check*)	Hard Federation	2	16	2	24	100	2	10	2	3	100
2	Bunyip	2	1	0	4	74·4	2	1	0	4	80·7
3	King's White	3	2	1	7	116·3	2	17	1	6	112·1
4 (*check*)	Hard Federation	2	12	0	0	100	2	11	1	18	100
5	Marshall's No. 3	3	11	0	1	125·2	2	10	0	26	98·1
6	Zealand	4	8	1	16	144	2	18	1	26	114·8
7 (*check*)	Hard Federation	3	6	0	5	100	2	10	2	20	100
8	Yandilla King	3	12	1	9	112·1	2	6	3	17	91·1
9	Roseworthy	3	2	0	2	98·4	2	9	1	11	95·1
10 (*check*)	Hard Federation	3	1	1	20	100	2	12	1	22	100
11	Warden	4	7	3	6	144	2	15	2	4	104·
12	Federation	2	15	0	11	91·1	2	8	2	13	88·6
13 (*check*)	Hard Federation	2	19	0	9	100	2	15	3	26	100
14	Currawa	3	17	0	22	136·8	2	19	2	2	105·3
15	Commonwealth	2	16	2	24	105·4	2	11	1	18	90·2
16 (*check*)	Hard Federation	2	11	0	13	100	2	17	1	23	100
	B Section.										
1 (*check*)	Hard Federation	2	6	1	17	100	3	11	3	16	100
2	Firbank	1	19	0	21	81	2	19	0	9	82·1
3	Clarendon	2	5	1	2	90	2	13	0	4	73·7
4 (*check*)	Hard Federation	2	12	1	5	100	3	11	3	16	100
5	Rymer	2	15	2	21	106	3	14	1	0	102·9
6	Warren	2	7	2	9	90·3	3	0	2	22	83·9
7 (*check*)	Hard Federation	2	12	2	15	100	3	12	1	26	100
8	Major	3	4	3	8	117·4	3	6	2	10	93
9	Cowra, No. 15	3	3	1	11	107·3	3	7	3	18	96·1
10 (*check*)	Hard Federation	3	2	0	9	100	3	9	2	27	100
11	,, ,,	3	4	3	8	105·2	3	15	0	15	103·8
12	Canberra	3	11	1	6	116·6	2	11	1	3	68·4
13 (*check*)	Hard Federation	3	0	2	22	100	3	17	1	27	100
14	Bomen	3	18	1	14	125	3	19	1	1	103·8
15	Improved Steinwedel	2	19	0	25	91·7	2	18	0	5	77·1
16 (*check*)	Hard Federation	3	6	2	10	100	3	14	0	11	100

Plot No.	Variety.	Mid-Season Planting.					Late Planting.				
		Acre Yield.				Percentage.	Acre Yield.				Percentage
		t.	c.	q.	lb.		t.	c.	q.	lb.	
	A Section.										
1 (*check*)	Hard Federation	2	17	0	1	100	1	13	2	21	100
2	Bunyip	3	0	1	17	104·1	1	17	1	16	98·2
3	King's White	3	5	2	23	111·4	2	7	2	16	112·3
4 (*check*)	Hard Federation	2	19	3	23	100	2	6	3	6	100
5	Marshall's No. 3	3	8	2	17	106·9	1	19	1	26	86
6	Zealand	4	18	1	7	141·8	2	16	1	19	125·4
7 (*check*)	Hard Federation	3	13	0	8	100	2	4	0	5	100
8	Yandilla King	3	14	1	10	103·7	2	3	3	0	99·1
9	Roseworthy	3	1	1	4	87·5	2	3	1	23	98·2
10 (*check*)	Hard Federation	3	8	2	17	100	2	4	1	10	100
11	Warden	4	6	0	4	128·4	2	15	3	26	125·3
12	Federation	2	16	2	8	86·6	1	13	1	21	74·3
13 (*check*)	Hard Federation	3	3	3	16	100	2	5	1	4	100
14	Currawa	3	5	0	13	105·8	2	4	2	15	101·6
15	Commonwealth	1	18	3	16	67·5	1	12	0	14	73·5
16 (*check*)	Hard Federation	2	17	1	6	100	2	1	0	11	100
	B Section.										
1 (*check*)	Hard Federation	3	0	1	13	100	1	15	2	14	100
2	Firbank	3	3	0	6	107·9	1	9	1	14	84·1
3	Clarendon	2	10	2	20	89·6	1	7	2	0	80·4
4 (*check*)	Hard Federation	2	14	2	17	100	1	13	1	21	100
5	Rymer	3	2	3	1	107	1	13	0	14	98·4
6	Warren	3	12	3	3	114·8	2	0	0	0	118·1
7 (*check*)	Hard Federation	3	6	2	10	100	1	14	0	7	100
8	Major	3	3	1	11	97·5	1	11	3	14	98
9	Cowra, No. 15	3	3	0	6	99·6	1	10	1	17	97·7
10 (*check*)	Hard Federation	3	1	2	9	100	1	9	1	14	100
11	,, ,,	2	17	0	18	87·2	1	13	0	14	112·9
12	Canberra	3	3	3	21	92	2	2	2	0	145·1
13 (*check*)	Hard Federation	3	13	1	13	100	1	9	1	0	100
14	Bomen	4	1	2	13	113·1	2	1	1	17	139·3
15	Improved Steinwedel	2	13	1	25	75·3	2	1	3	18	138·9
16 (*check*)	Hard Federation	3	9	2	25	100	1	10	2	22	100

The order of merit for the varieties tested may be summarised in the following tables. The actual yields and percentages may be ascertained by referring to Tables I and II.

TABLE III.—Showing Order of Merit for Grain Yields in Wheat Variety Trials, Women's Training Farm, Cowra, 1917–18.

Varieties in Alphabetical Order.	Early Planting.		Mid-Season Planting.	Late Planting.
	Fed-off.	Not Fed-off.		
Bomen	2	2	9	3
Bunyip	12*	15*	1	—
Canberra	1*	14*	2	2
Clarendon	5*	17*	3	1
Commonwealth	20	16	20	19
Cowra, No. 15	16	9	18	15
Currawa	9	5	11	11
Federation	17	12	14	17
Firbank	3*	20*	4	9 (*æq.*)
Hard Federation (*check*)	11	10	12 (*æq.*)	13
Improved Steinwedel	4*	19*	10	7
King's White	7	4	5	8
Major	15	18	19	18
Marshall's No. 3	10	3	6	4
Roseworthy	13	7	12 (*æq.*)	9 (*æq.*)
Rymer	14	6	17	14
Warden	6	1	16	12
Warren	18	8	7	5
Yandilla King	8	11	8	6
Zealand	19	13	15	16

* Yields affected by sparrows.

TABLE IV.—Showing Order of Merit of Hay Yields in Wheat Variety Trials, Women's Training Farm, Cowra, 1917–18.

Varieties in Alphabetical Order.	Early Planting.		Mid-Season Planting.	Late Planting.
	Fed-off.	Not Fed-off.		
Bomen	5	5	4	2
Bunyip	20	17	10	12 (*æq.*)
Canberra	7	20	15	1
Clarendon	18	19	16	18
Commonwealth	12	13	20	20
Cowra, No. 15	10	9	13	15
Currawa	3	3	9	8
Federation	16	14	18	19
Firbank	19	16	6	17
Hard Federation (*check*)	13	7	12	9
Improved Steinwedel	15	18	19	3
King's White	8	2	5	7
Major	6	11	14	14
Marshall's No. 3	4	8	8	16
Roseworthy	14	10	17	12 (*æq.*)
Rymer	11	6	7	11
Warden	1 (*æq.*)	4	2	5
Warren	17	15	3	6
Yandilla King	9	12	11	10
Zealand	1 (*æq.*)	1	1	4

Sheep-yard Equipment.

SHEARING SHED, DRAFTING YARDS, AND DIP COMBINED.

J. WRENFORD MATHEWS.

THE Department has on several occasions published articles on this subject, but it has recently given further consideration to the construction of shearing-shed and yards.

The plan now submitted is similar in design to that employed in equipping several of the Departmental farms. It provides means for yarding, drafting and housing, and also general shed conveniences, together with facilities for dipping. The scheme was first tried without the dip at the Trangie farm, and as it proved satisfactory, it was subsequently accepted as a standard design for the North Bangaroo and Temora farms.

Observing, however, the alarming rapidity with which sheep-lice (*Trichodectes sphærocephalus*) continued to spread throughout practically the whole flocks of the State, before proceeding with the work at these two latter places it was deemed necessary to revise the plans in order to incorporate provisions for dipping.

At the places named the Department incidentally undertakes the shearing of the flocks of neighbouring owners.

Dipping may be undertaken either "off shears" or at an interval of six weeks after shearing, as occasion may arise. In some instances where the flocks are badly infested it will be necessary to dip "off shears." Thus, with the facilities provided, as set out in the plan, each lot as they come "off shears" may be passed through the dip, and the joint operation is completed before the sheep leave the property. This method may well be followed by others.

The plan is presented with the reservation that any part of it that may be used for yards, shed, or dip can be modified according to the situation or site, also according to what extent it may be required to fit in with existing structures. But as the dimensions of all sections of the plan are given separately, there is nothing to prevent any part being employed to suit the requirements of the case. The dimensions of the dip may therefore be used independent of the shed or those of the yards as required.

The Yards. (Fig. 1.)

The main idea embodied in the construction of these is to provide ample room in the various subdivisions, to conserve space where possible, to accelerate the free movement of the sheep, and to make the whole structure fit in with the special requirements and design of the shearing-shed. To each section has been assigned a special use. In the first place, a line has been drawn to mark the division between the drafted and undrafted sheep. Wherever it has been possible to make a compartment fulfil a twofold purpose this has been done. For example, the space apportioned to the outer receiving yards also serves as a convenient enclosure for the

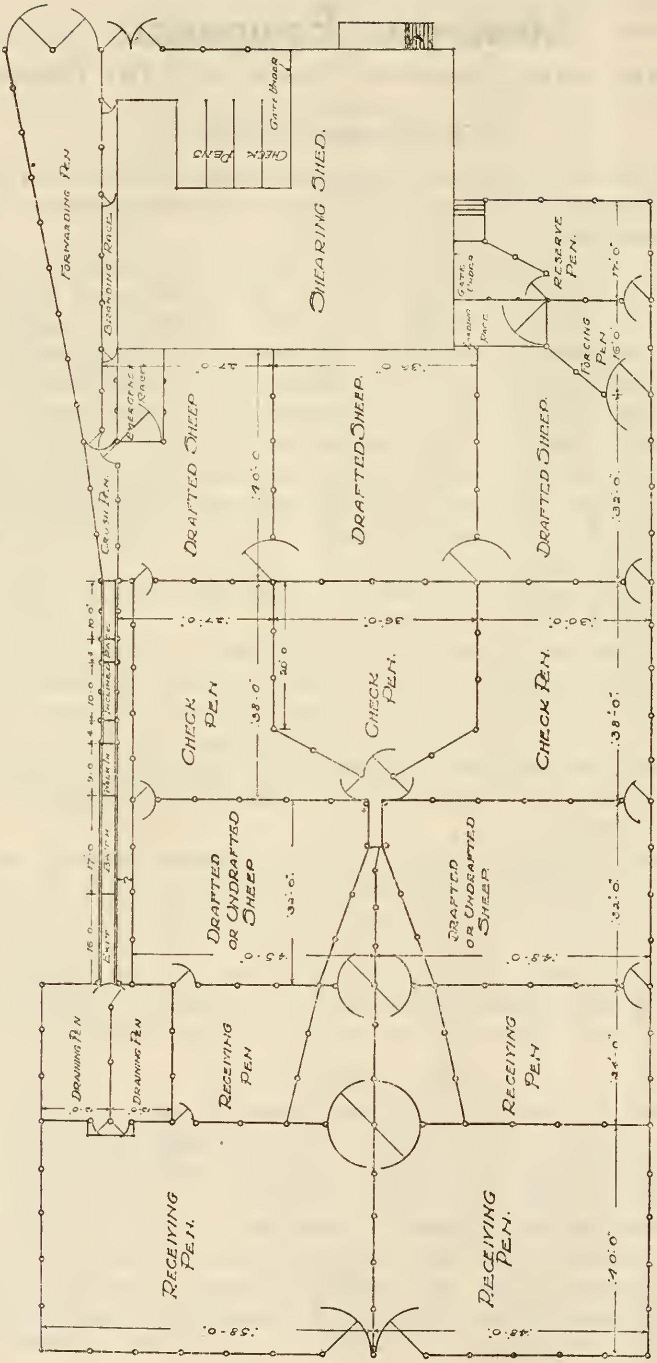

Fig. 1.—General Plan of Sheep Yards and Dip, North Bangaroo Stud Farm.

sheep that are released from the draining-pens of the dip. Again, the space under the floor of the wool room and shearing boards is utilised to shelter the sheep, and so provides against loss of time occasioned by wet weather.

Two overflow yards have been added to each of the receiving yards, and, with the exception of the middle one, from each of the check-pens the sheep may be despatched either way. The drafting arrangements provide for two forwarding pens as well as the necessary crush-pens. The sheep may therefore be transferred from the receiving yards from either side. The gates dividing the forwarding from the crush-pens mark the main division line separating the sections allotted to the drafted and undrafted sheep.

At the front, where the crush-pens narrow down to form the neck of the drafting-race, a swing gate is hung to admit of passage according to from whatever side the sheep may be drawn. On both sides of the race, and extending far enough along the outer line of the crush-pen to allow sufficient space for a gate, extra pens to take off any odd sheep may be placed.

The lines on which the yards have been designed allow of the sheep being drafted three ways. To meet the requirements of this mode of construction two drafting gates are necessary; these are decidedly preferable to the obsolete method of the single gate. The use of the double gate not only protects the sheep from being knocked about, but expedites the work of drafting. The two gates are hung one from each of the middle posts of the inner check-pen, and when in line serve a twofold object. The sheep coming down the race are afforded a clear view of those which have already accumulated in the check-pen. By this means they are in a manner attracted, and make all possible speed to join them. The pen therefore not only serves its own purpose, but acts as a decoy as well.

The drafting gates are held in position by staples which may be removed at will, and so permit the gates to be thrown back. Free means of access is afforded between the two outer check-pens and the sheep to be transferred from one to another as necessity may arise.

To minimise the risk of injury, which is only too often caused through the sheep being crowded into yards, the corners at all points may be angled off. The triangles formed by this construction afford appropriate enclosures for the planting of trees to provide both shade and shelter for the sheep. Being handy, they may also be availed of to pass any odd sheep into that it may be desired to separate from the mob.

The Shed. (Figs. 2, 3, 4, and 5.)

The shed has been designed on the L-shape principle. It is built on piles and has an elevation of 4 feet. The counting-out pens have an easterly aspect, so that the sheep shorn in the early morning may have the benefit of the sun. The ideal situation is on a slope, but where the ground is flat the building will require to be raised. When built on a slope, by making a slight excavation at the rear, the sheep may be got into the shed on the ground level. But in situations where the ground is flat, and the shed has to be built on piers, this will have to be done by the means of ramp. With a natural slope, the space covered by the boarded floor may be utilised as storage, whilst at the farthest point of the incline may be erected the loading stage. The sheep are got underneath through a gate, which is situated to the right of the loading-race and under the landing at the side entrance of the shed. The battens which comprise the floor space set apart for the sweating and catching-pens are set ⅝ inch apart, and in order to ensure firmness of tread for the sheep, are constructed of pine laid alternately in widths of 3 x 1½ and 2 x 1½. Underneath, on a level with the boarded floor, the space is divided so that the sheep there accommodated do not come in contact with the droppings from those on the battens above. The erection of a shed on a level surface has the advantage of enabling the manure deposited through the battens to be removed without difficulty.

Allowing 4 square feet per sheep as a fair basis of calculating the space that may be occupied by a number of sheep in any enclosure, a shed of the dimensions of that at Temora would be capable of holding 275 sheep on the battens and, roughly, 310 underneath the floor space. Under anything like normal conditions with the number of shearers that the shed provides for, it would be possible therefore to complete the whole shearing without loss of time through wet weather. Indeed, this was put to the actual test on the occasion of 1917 shearing at the Trangie farm. Though storms were fairly frequent throughout the shearing of that year no loss of time was experienced on that account. Taken on a basis of 100 sheep per day per man, with a shed of the dimensions given, provision can be made for practically two full days' shearing.

In designing the shed, the dimensions have been worked out on a definite ratio, according to the size of the flock, or otherwise from a consideration of the number of sheep that are likely to be put through. It would be hardly worth any shearer's while to engage to shear under 1,000 sheep. This number has therefore been made the minimum basis in deciding the number of stands, and in working out proportionately the various appointments of the shed. For example, a shed like the one at Temora would have the capacity of comfortably dealing with 3,000 sheep. At Bangaroo farm, where between 4,000 and 5,000 sheep (apart from those of the neighbours) are shorn yearly, a four-stand shed has been provided. At the Trangie farm the shed is again proportionately larger according to scale, being worked out to accommodate five stands. A higher basis of so many sheep per man may, of course, be taken, and which would reduce the capital outlay as well as increase the number of sheep that may be handled. But for reasons that are only too well known to those who engage in the work, it is not always wise to enter into an unduly protracted shearing. Better to have the shed large enough to enable the work to be got through quickly than for it to be on the small side and be inconvenienced by delays. Besides, a man who is well equipped in this direction can always, if so desirous, undertake the shearing of his neighbours' flocks, and so reduce the cost of shearing his own.

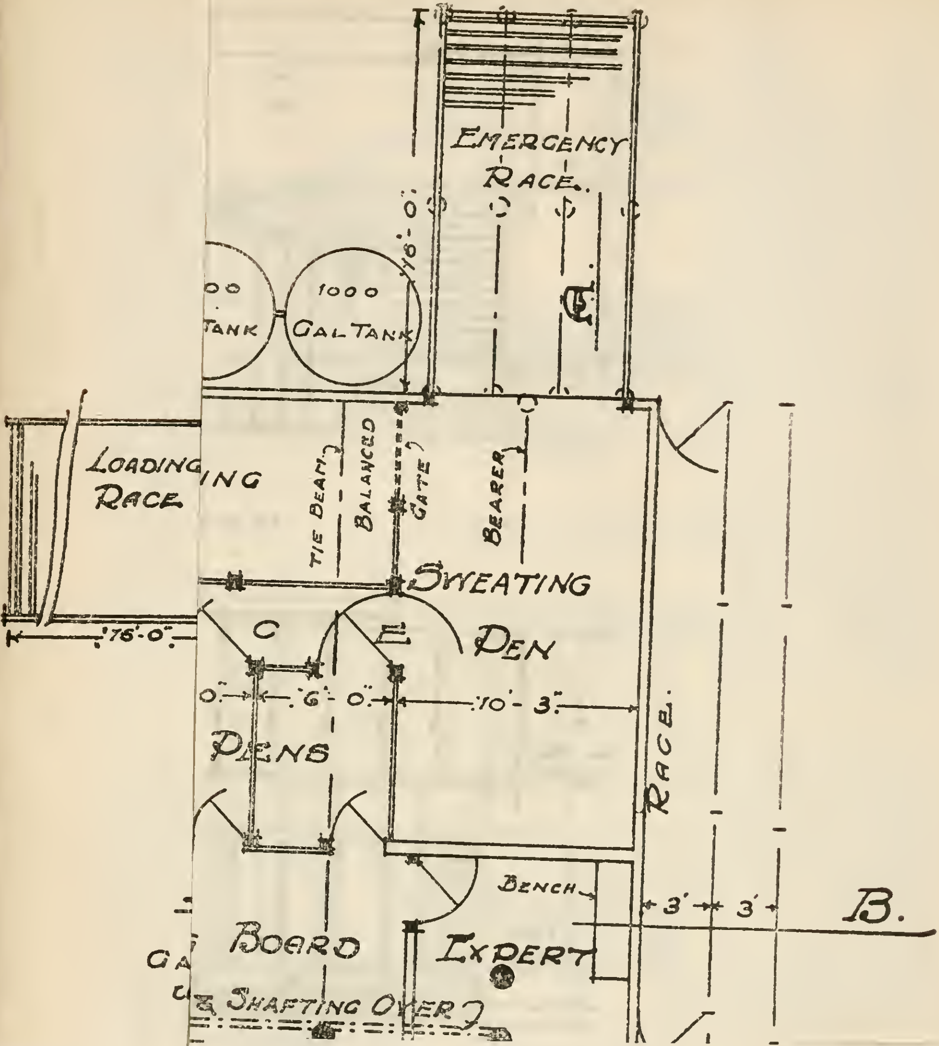
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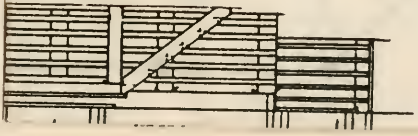
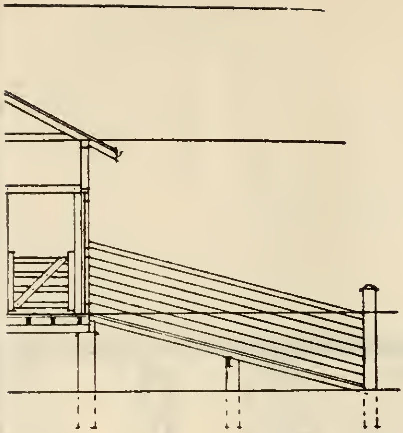
Fig. 5.-





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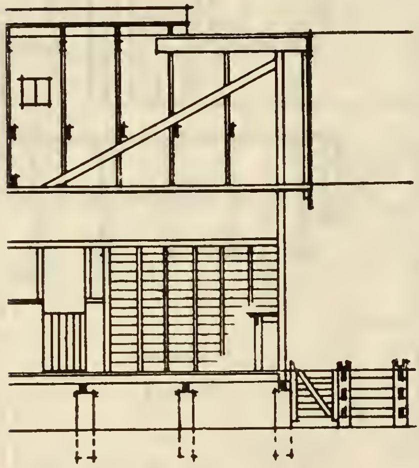
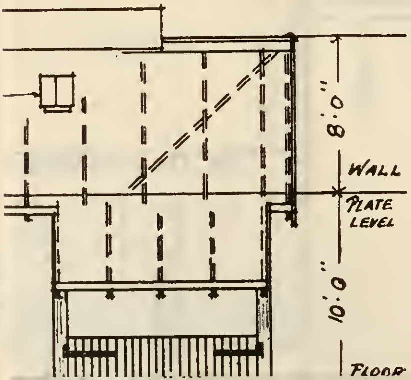


ın Farm.



The main idea incorporated in the plan was to have the whole interior working of the shed immediately under notice. The wool tables and bins are placed in close proximity to the shearing-board. The press is handy so that from the corner of the shearing-board the combined operation of shearing, skirting, and classification of both fleeces and pieces, as well as pressing and branding of bales, come directly under observation. The fleece bins are built in the line with the shearing-board, thereby the floor space of the wool room is not encroached upon, except for such work as entails the handling of fleeces, and which it should be reserved for. The wool table is placed immediately in front of the bins, and as the man engaged there can also undertake the classing of the wool as the fleeces are rolled, they may be at once placed in the bins.

The rolling-table has been made 12 feet long x 4 feet 3 inches wide. At it all necks and fore parts of the fleece may be treated, while at the end, to the right, under the window, another small table, with bins on each side, is fixed, and where the breeches or posterior portions of the fleeces, on being removed, may be also dealt with. With the work thus concentrated there should be no accumulation of "pieces," which is one of the chief drawbacks to the successful handling of wool, especially where proper conveniences have not been supplied.

The Chutes and Branding Race.

The chutes have been so constructed as to ensure safe delivery of the sheep in their passage downward from the shearing-board. Those have the sides boarded in and the floor hollowed in the middle, and so formed concave to reduce the abruptness of the descent. The sheep descend steadily, and, landing on their hindquarters instantly, rise to their feet and walk away without injury.

As the plan shows, the small enclosure built to the outside of the counting-out pens completes the square of the shearing-shed block. From this the sheep, on being released from the pens, may be discharged in two directions. The one through the gate on the left admits of their entrance under the shed, where they may be sheltered if the night be cold. Ordinarily they are turned to the right, round the corner into the drafting-race. This has been made sufficiently large to hold a full complement of sheep, *i.e.*, the number that would be shorn in the time occupied during a single run, and provided by the different intervals set apart in the day's shearing, and despatched from the counting-out pens.

The Dip. (Fig. 6.)

The main object embodied in the plan has been to utilise the space economically and conveniently so that the sheep may have whatever necessary done to them as they traverse the various departments between the yards, and are at length returned to the paddock. Finally, to complete the operation, we come to the stage where they may be turned into the dip.

As those well versed in the work can tell, one of the most difficult tasks of all is to provide means that will induce the sheep to enter the dip.

Various contrivances have been tried. We have examples of the "walk-in principle," the "slip-slide," "false floor," and various devices of decoy pens, but none seem to have proved satisfactory. With young sheep trouble seldom occurs; but once having passed through, they never seem to forget their former experience, and it is only by sheer force that they can be compelled to face the ordeal again.

The plan has been designed to allow the sheep to be released in the yard beyond the branding-race, or to be transferred to the crush-pens at the approach to the dip as required. It also admits of the dip being used independently of the other structure in the event of dipping being undertaken at a later interval. To provide for this the forwarding-pens have been extended at right angles beyond the line of the drafting-race. The sheep may be accommodated in the drafting yards and brought round the shed to the approach to the dip in numbers as required.

Now follows the task of effecting proper immersion. The sheep are driven through the forwarding into the crush-pens, and here commences the difficulty usually experienced of getting them further. To do this an idea that is somewhat novel, though not altogether original, has been adopted. Between the end of the crush-pen and the entrance to the dip a space of 28 feet has been allowed. In this space are provided the contrivances for getting the sheep into the bath. At the front of the entrance from the crush-pen is erected a race or ramp, as it may be called, built 16 inches wide, boarded in on the sides, and rising to a height of 2 feet 6 inches in a length of 10 feet. It is asserted that sheep will walk up an incline more readily than they will advance on an even surface. The idea of having the staging elevated is also to hide the sheep previously going through the bath from view and so induce those in the rear to follow. Continuing from this point of elevation, the race for a distance of 4 feet is level. Then commences the drop, which is regulated so as to facilitate the precipitation, but at the same time to avoid risk of injury. For the first 10 feet the gradient has a fall of 18 inches, followed by one still more abrupt of 1 foot in four to the water's edge. The floor of the raised and level sections of the race is constructed of battens placed crosswise so as to give foothold, as well as to allow all dust and accumulations to riddle through, while that of the decline is made of planks planed very smooth in order that the sheep, once having entered upon the down grade, cannot stop themselves, and must be gently carried into the bath.

The length of swim and other dimensions are given on the plan, and further explanation should be unnecessary.

In submitting these plans, the Department has to acknowledge the incorporation of many useful hints which have been received from others, and, in embodying their ideas, feels grateful for assistance generously rendered. While conscious of many disadvantages in attempting to prepare a design to meet all requirements, it is hoped that this endeavour to present a thoroughly up-to-date working plan will assist many of the smaller flock-owners.

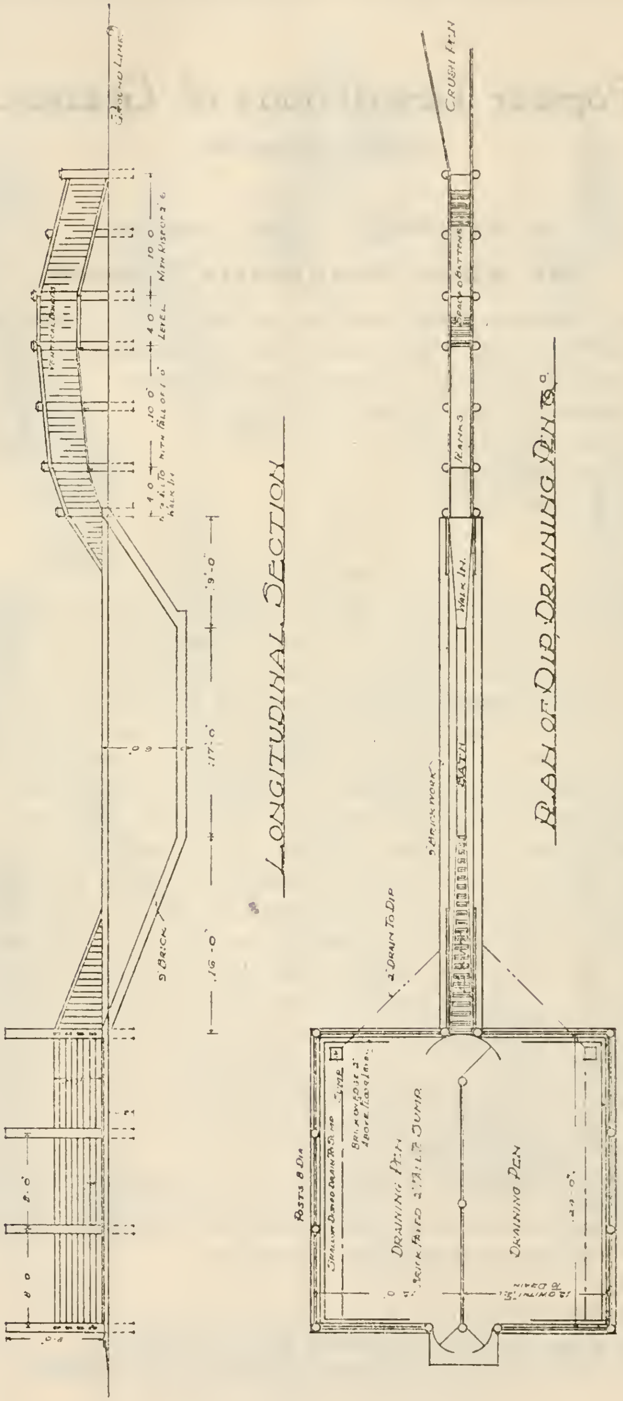


Fig. 6.—Section and Plan of Sheep Dip, North Bangaroo Stud Farm.

Popular Descriptions of Grasses.

[Continued from page 631.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE WEEDY ERAGROSTIS GRASSES.

THE weedy *Eragrostis* grasses are those which have been introduced from foreign countries, and which have become very aggressive throughout different parts of the State. The most important are:—

Eragrostis major (Stink grass), (Fig. 1);
E. neo-mexicana (Fig. 2);
E. Purshii (Fig. 3);
E. pectinacea (Fig. 4); and
E. asper.

Eragrostis major (Stink grass).

A detailed description of this grass, illustrated by a plate, by Mr. J. H. Maiden, I.S.O., F.R.S., Government Botanist, appeared in the *Agricultural Gazette* for July, 1912. Since that time it has spread to a considerable extent, and is now being continually forwarded to the National Herbarium for identification during the summer months. It was introduced from America, and owing to its heavy seeding habits is probably the commonest introduced grass on the Tablelands and Slopes during the warmer weather. The grass is characterised by having leaves with glands along their margins. These glands exude a chemical principle with a strong smell, particularly on a dewy morning or after rain, hence the common name of Stink grass.

It is very common on light soils, and is a frequent sight on railway enclosures and fallowed lands in wheat-growing centres. It is very aggressive, and will smother out native grasses and other herbage if given free scope. There is no doubt that in its early stages the leaf growth is very succulent, and is readily eaten by sheep. Its life, however, is very short,

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EXPLANATION OF PLATE.

Stink Grass (*Eragrostis major* Host).

1. Whole plant, reduced in size.
2. Part of a spikelet, showing central nerve, and one lateral nerve. The third nerve is not seen with the glumes in their present position.
3. Flowering glume seen from the back, showing the keel and the two lateral nerves.
4. Flowering glume, with palea, seen from the side.
5. Grain.
6. Base of leaf, with ligule.
7. Base of leaf, with ligule of *E. Brownii* Nees (for comparison).
8. Edge of a leaf, showing the characteristic glands (much enlarged).

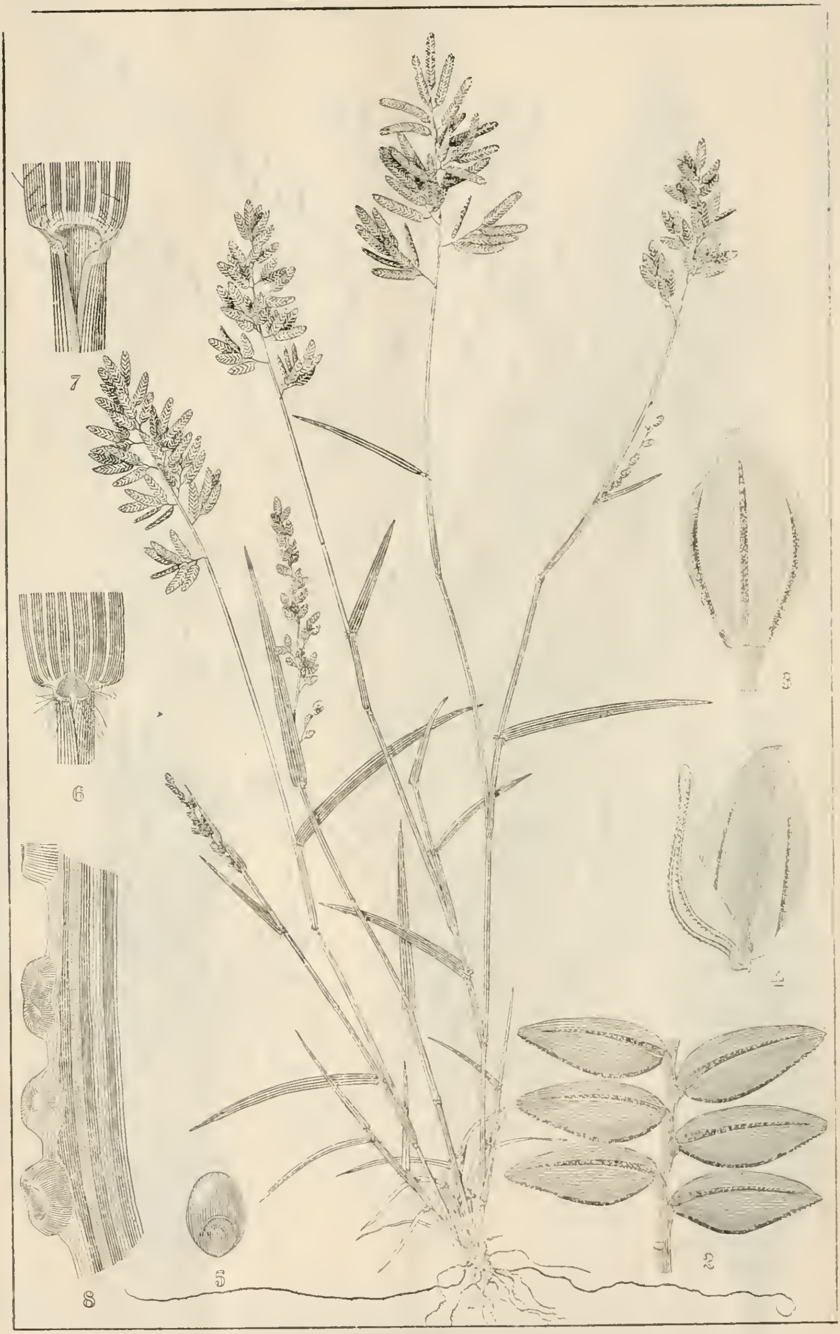

Fig. 1.—Stink Grass (*Eragrostis major* Host.)

Note the characteristic glands on the margin of the leaf (8), a feature which distinguishes it from the other Eragrostis grasses.

Popular Descriptions of Grasses.

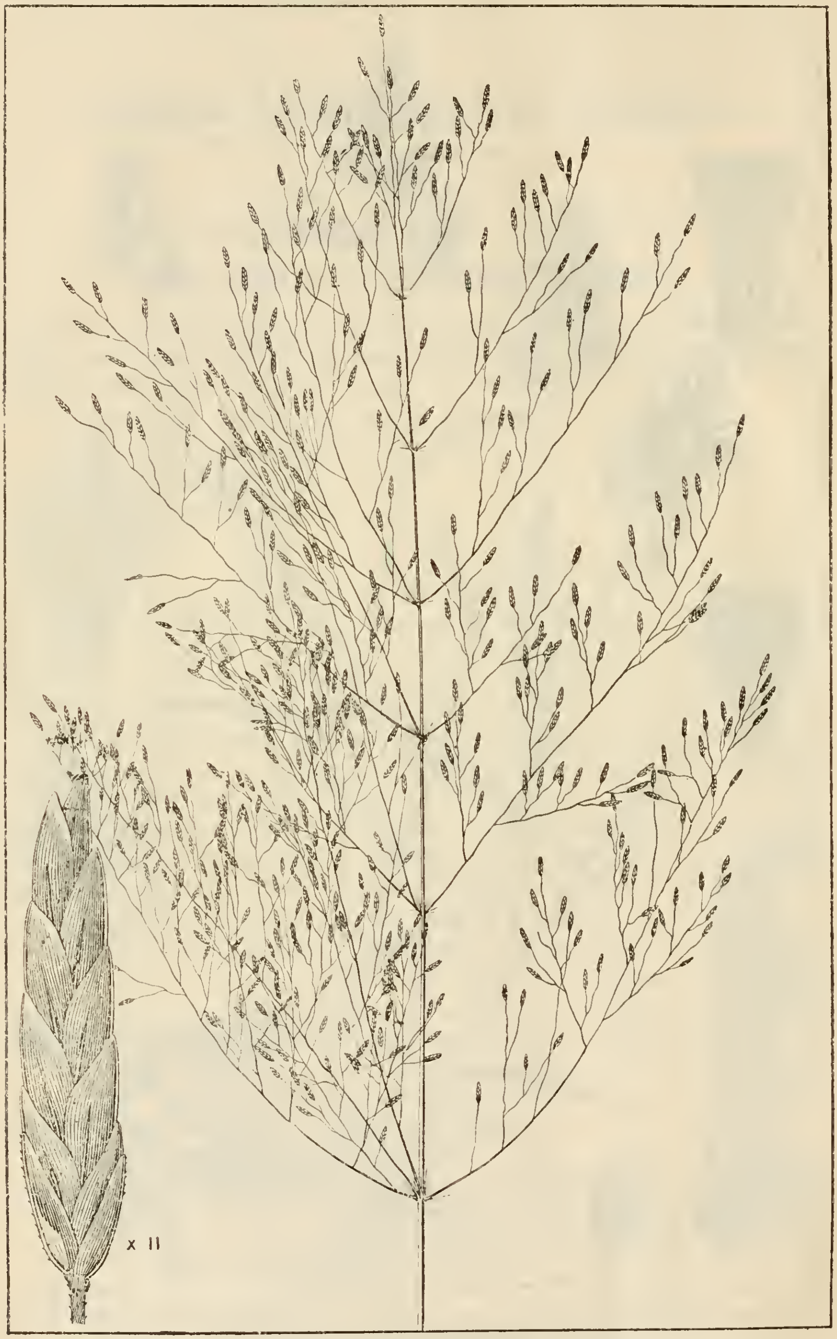

Fig. 2.—*Eragrostis neo-mexicana.*
This grass somewhat resembles *E. pectinacea*, but the flowering branches are more symmetrically arranged on each side of the main axis than in *E. pectinacea*.

Popular Descriptions of Grasses.

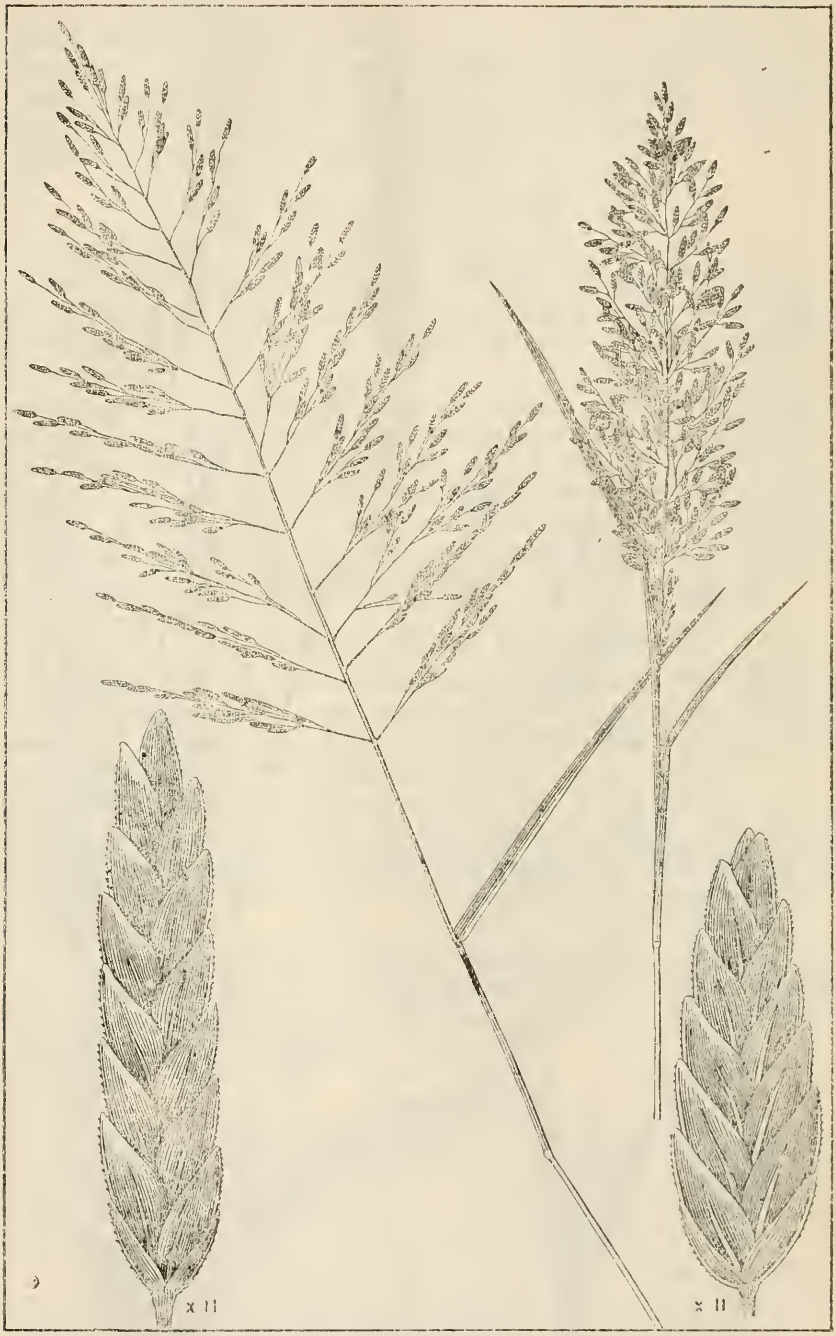

Fig. 3.—*Eragrostis Purshii* Schrad.

This grass can be distinguished from the others by the absence of hairs in the flowering axils.

POPULAR DESCRIPTIONS OF GRASSES.

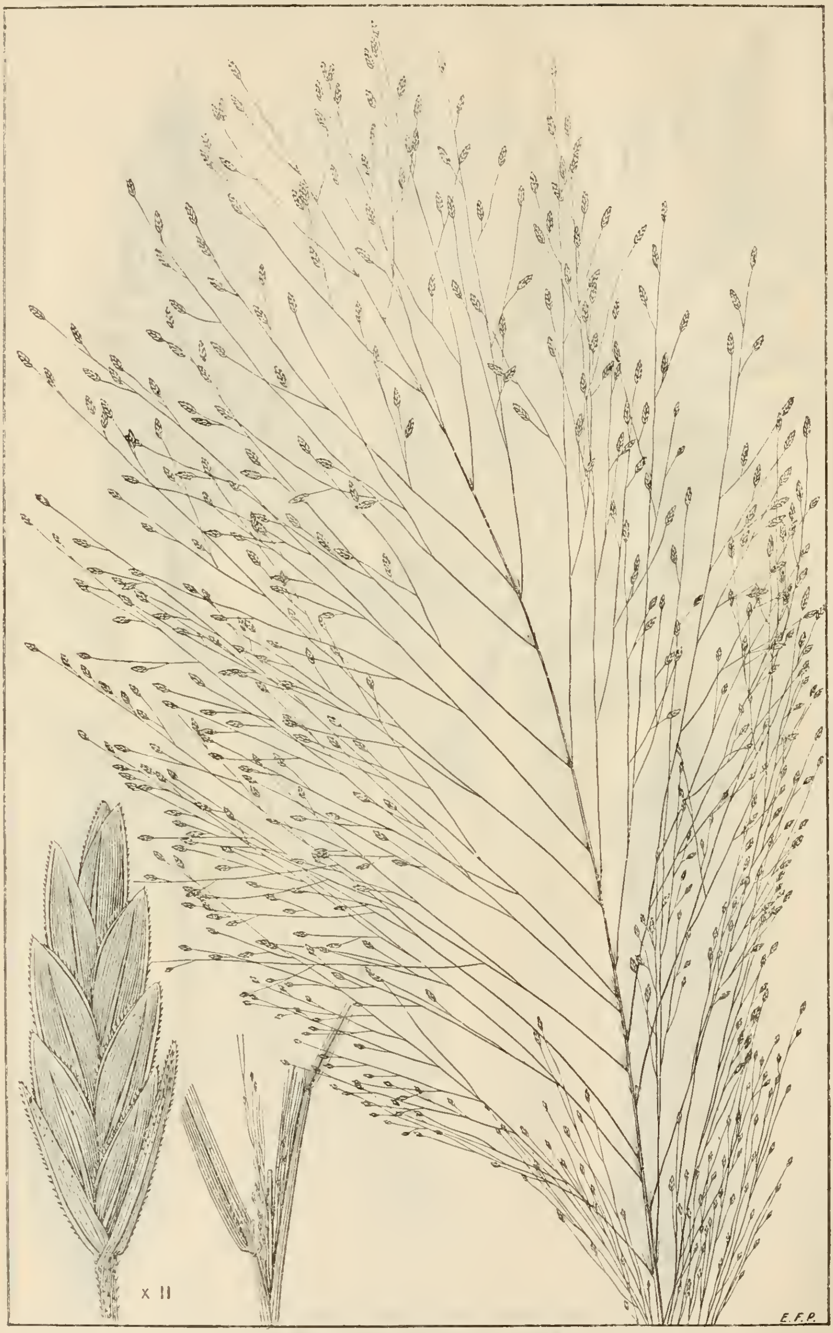

Fig. 4.—*Eragrostis pectinacea* (Michx.) Steud.

See note to Fig. 2.

POPULAR DESCRIPTIONS OF GRASSES.

and in a couple of months its flowers begin to appear, when it becomes very unpalatable. It seldom lasts longer than three months—much shorter if the season happens to be a dry and hot one. The aggressiveness, short-lived habit, and limited palatability of the grass render it a very undesirable plant to have in pastures or fallowed lands.

Eragrostis neo-mexicana.

This is a grass somewhat resembling *Eragrostis pellucida* as far as the inflorescence is concerned, which has a dark-leaden colour like that grass. As a rule, however, it grows much taller than *E. pellucida,* sometimes reaching a height of 4 feet, and its spikelets when mature present an inflated appearance.

This grass has been introduced from America, and has spread rapidly in different localities. It has become extremely common on the Yanco Irrigation Area, particularly along the canals. It is annual in character, however, and its root system is not particularly difficult to eradicate. As far as can be seen it has not become troublesome on cultivated lands. Its broad flat leaves are succulent, and in America it is credited with producing hay as good as that of the closely related species, *E. abyssinica* (Teff grass).

Eragrostis Purshii and *E. pectinacea.*

These are also two American grasses introduced some years ago, and which are now spreading vigorously throughout different parts of the State. Both are extremely fond of light soils, and thus their frequent presence on sandstone or granitic formations.

Eragrostis Purshii has hairy, flowering branches, and the glumes of the flowering spikelets are slightly rough on the keels. This grass grows well on the Yanco Irrigation Area, on the light soils of the Cumberland district, and on the Tablelands generally. It is annual in character, and has no agricultural value.

E. pectinacea can readily be distinguished by its stiff, spreading branches. Unlike *E. Purshii,* it is perennial in habit. Its inflorescence is rather striking, and it makes a fine ornamental grass. It grows in situations similar to those of *E. Purshii.*

Eragrostis asper.

This grass is becoming very common on the Riverina and Southern Tablelands. It grows remarkably well, and provides a large amount of good feed during the spring months of the year. Its aggressiveness almost equals that of Stink grass, but it is much more palatable and longer-lived.

E. asper somewhat resembles *E. pectinacea* in having hairs in the axils of the flowering branches, but its inflorescence is not so stiff. It differs from *E. Purshii* in having no fringes of hairs on the flowering glumes.

Farmers' Experiment Plots.

MAIZE EXPERIMENTS, 1917–18.

Lower North and Central Coast District.

G. G. POTTS, H.D.A., H.D.D., Assistant Inspector of Agriculture.

DURING the past season maize, barley, and manurial trials were conducted at four different centres on the Lower North and Central Coast. The names and addresses of farmers who co-operated with the Department in carrying out the work are as follows:—

R. Richardson, "Bellevue," Mondrook, Tinonee.
M. Smith, "Bona Vista," Paterson.
G. Brown, Wingham Road, Comboyne.
G. Hodges, Yarramalong, via Wyong.

The experimenters are to be congratulated on the methods of cultivation prior to sowing and during the growing period, for although hampered with continual wet weather, much judgment was exercised in carrying out the necessary cultivation to destroy weed growth. The season under discussion cannot be regarded as altogether suitable from a maize-grower's point of view, for although ample moisture was present for germination and subsequent growth, the continued wet weather during January and February assisted to a large extent the spread of Leaf Blight (*Helminthosporium*), which was most apparent at Comboyne and Yarramalong. The varieties least affected with this disease gave the greatest yields in each instance. It is worthy of note that acclimatised seed resisted the attack of Leaf Blight to a much greater degree than that introduced from another district. This experience has been borne out in previous seasons.

The effective rainfall registered at each centre was as follows:—

Month.	Tinonee.	Paterson.	Comboyne.	Yarramalong.
	Points.	Points.	Points.	Points.
September, 1917 ..	864	......	......	......
October ,, ...	311	......	......	......
November, ,, ...	921	......	787	......
December, ,, ...	271	398	343	192
January, 1918 ...	648	564	699	704
February, ,, ...	602	417	881	481
March, ,, ...	238	249	594	91
April, ,, ...	......	289	380	354
May, ,, ...	......	31	266	50
Total Points ...	3,855	1,948	3,950	1,872

Tinonee Plot.

Trials with varieties and manures were conducted on deep alluvial soil, characteristic of the Manning River flats. The land had previously been cropped with maize for two years, and prior to that was under natural pastures for a period of ten years. The preparation of the soil consisted of ploughing 10 inches deep, and rolling in June; fallowed until the latter end of August, when it was again ploughed, rolled, and harrowed three times at intervals. Sowing was carried out on 11th and 12th September, with the rows 4 feet apart, and three grains were dropped every 40 inches in the row. Sufficient moisture was present for germination, but the extremely heavy rain after planting caused a thin stand throughout. One variety, viz., All Gold, failed to germinate.

The cultural operations during growth were as follows:—Cultivated twice between the rows, first week in October; hilled with a light mouldboard plough, and cultivated twice the latter end of the month.

The early maturing varieties, Reid's Yellow Dent, Gold Standard Leaming, and Silvermine, were affected to a large degree by Leaf Blight, which made its appearance early in the season. Mr. Richardson cannot remember noticing Leaf Blight so prevalent on maize before Christmas on the Manning. The continued wet weather experienced in November, and indeed throughout the growing period, no doubt assisted the spread of this disease. However, the yields are most satisfactory, the varieties averaging 77¼ bushels per acre. Golden Beauty, Leaming, Palecap Horsetooth, Silvermine, and White Horsetooth gave a good account of themselves. The yield of Silvermine is worth noting, as this variety was very much affected with Leaf Blight. If acclimatised seed is used, its susceptibility to this disease may possibly be eliminated to a large extent.

Paterson Plot.

At this centre a variety trial was conducted on rich deep alluvial soil, which carried lucerne the previous season. The land was then prepared and sown with potatoes, which failed owing largely to the extremely wet conditions prevailing. Cultural operations for the maize experiments commenced in November, when the land was ploughed, cultivated with the spring-tooth, and tine-harrowed. The trials were sown on 15th December, the rows being 4½ feet apart, with three grains dropped every 40 inches. The germination was excellent, except in the case of All Gold, which failed, as previously experienced at Tinonee. Cultivation during growth was confined to one scarifying with the single-horse cultivator and hilling with the plough, which was sufficient to check weeds. The growth was well advanced and even, and the plots looked very promising until Leaf Blight made its appearance, when it was apparent that the early varieties were being attacked freely. This disease, no doubt, was instrumental in decreasing the yields, although not so markedly as in other centres. In spite of this, the plots compared most favourably with other maize crops in the district, and much interest was shown by farmers in the different varieties under trial.

Stud Improved Yellow Dent gave early indications of vigorous growth, and throughout the growing period appeared to be the most promising variety under trial. Compared with bulk seed, the stud gave an increased yield of

17½ bushels per acre. Palecap Horsetooth, Improved Yellow Dent, Golden Beauty, and Golden Nugget are all suitable varieties, judging from yields and growth during the past season.

Comboyne Plot.

The experiments were conducted on red volcanic friable soil, which predominates on the Comboyne Tablelands. Sowing operations commenced on 30th October, the rows being 4 feet apart, with three grains dropped every 40 inches in the row. The land on which the varieties were tested has grown maize continuously for twelve years, while that on which the manurial trial was conducted carried a crop of potatoes the previous season. Soil preparation consisted of ploughing 7 inches deep in September, followed with the harrows. The crop was cultivated three times during growth, when 6 inches high, at 2 feet, and at tasselling stage. A glance at the rain registration shows that 39½ inches fell during the growing period. This abnormal precipitation resulted in slow growth, and much damage was done by Leaf Blight, such varieties as Silvermine, Goldmine, Gold Standard, Leaming, and Early Yellow Dent being most affected. Golden Nugget, Golden Beauty, Leaming, and Potchefstrom Pearl were not so susceptible to this disease, and yielded comparatively well. The yields throughout were disappointing; but the season was far too moist, causing the usual sickly growth and encouraging Leaf Blight.

Yarramalong Plot.

Variety and manurial trials were conducted at this centre on light sandy loam, which grew a crop of maize the previous season. The land received thorough preparation prior to planting, the following operations being carried out:—June, ploughed; July, disc-harrowed; September, skim-ploughed crossways, and tine-harrowed; December, skim-ploughed and cross-harrowed. The plots were sown on 6th December, the rows being 4 feet apart, with single grains dropped every 18 inches. The variety trial was not manured. The germination throughout was patchy, and subsequent growth very slow. Owing to the heavy rainfall in January, and the low-lying position of the plots in parts, many of the plants died out, and a thin stand resulted. The continuance of wet weather, and consequent dull days, considerably facilitated the spread of Leaf Blight, which was most marked at this centre, and did much damage to varieties, especially to the early maturing ones. Silvermine and Goldmine failed owing to the ravages of this disease. During growth the plots were cultivated once in December, and tine-harrowed across the crop in January. Further cultivation was impracticable owing to weather conditions. The yields as a whole were low, and this can be accounted for largely by excessive rainfall and prevalence of Leaf Blight. Although the light-textured soils of this district are not capable of producing crops equal to those grown on alluvial flats, yet the yields obtained during the past season can be improved upon with more favourable weather conditions and the use of acclimatised seed to overcome the ravages of Leaf Blight. Of the varieties under trial, Palecap Horsetooth, Potchefstrom Pearl, and Golden Nugget yielded comparatively well.

TABLE I.—Showing Results of Variety Trials, Lower North and Central Coast District, 1917–18.

Variety.	Tinonee.	Comboyne.	Paterson.	Yarramalong.
	Bushels.	Bushels.	Bushels.	Bushels.
Improved Yellow Dent (Bulk) ...	75	......	87	27½
Improved Yellow Dent (Stud) ...	......	......	104½	......
Red Hogan	72½	......	70	19
*Palecap Horsetooth	91¼	......	98½	40½
Gold Standard Leaming	63¾	14½	......	......
Reid's Yellow Dent	62½	16½	......	......
Leaming	83¾	30⅜	78½	26
*Red Leaming	71¼	......	......	......
*Golden Beauty	94⅜	18¾	77	......
*Large Yellow Horsetooth ...	70	......	......	......
*White Horsetooth	82½	......	......	......
Boone County White	75	16¾	67	......
Silvermine	82½	15¾	......	(failed)
*Giant White	80	......	71½	29
Potchefstrom Pearl	......	26¾	......	30½
Hickory King	......	16½	......	20¾
Prairie Queen	......	17½	......	......
Goldmine	......	16¼	63	(failed)
*Golden Nugget	......	31	77	30¾
Funk's Yellow Dent	......	19¼	......	......
Early Yellow Dent	......	17¾	......	......
Eureka	......	......	74½	......
Craig Mitchell	......	......	74½	......
Average yield per acre ..	77¼	19¾	78⅗	22½

* Denotes Farmer's Variety (acclimatised seed).

Seed Selection.

The importance of selecting maize seed in the field from plants growing under normal conditions, with high yielding qualities, cannot be too strongly impressed upon farmers. Haphazard barn selection is out of date, and rightly so too, for it can be clearly seen that without the knowledge of conditions under which large and productive ears were grown, no control whatever is exercised in the succeeding crop. "Like produces like," but it does not necessarily follow that a plant which had unusually good conditions to grow under during a season, will produce as good results the following season, when competing under normal conditions with other plants. Rather select from plants showing superior qualities and growing in fair competition with other plants, than from those having some undue advantage during growth. The farmer who improves his seed by field selection, and continues the work with a stud plot, also improves his financial position, and is amply repaid in every respect for the small amount of labour involved. The results of the past season clearly demonstrate the advantages of stud seed; and the policy of comparing stud and bulk seed of Improved Yellow Dent and other varieties will be continued next season.

Particulars of Varieties Under Trial.

Red Hogan.—This is a late maturing, tall-growing variety (having averaged 13 feet in height), with coarse stems and a small percentage of suckers. The cobs being upright are well protected with good husk covering, and carried high on the stalk. The ears are large, cylindrical, and average 80 per cent. of grain to core. The grain is bright, medium red in colour, having a pale reddish yellow cap, with a smooth to medium rough dent. Owing to the effect of Leaf Blight and wet conditions at Yarramalong the yield was poor, but at the other two centres this variety gave satisfactory returns.

Improved Yellow Dent.—Yielded consistently throughout, and resisted Leaf Blight extremely well. It is medium late in maturing (slightly earlier than Red Hogan), grows tall, averaging 14 feet in height, with medium thick stalks, and upright ears carried 6 to 7 feet high on the stem. The ears are large, cylindrical, and shell 84 per cent. of grain, which is bright golden in colour, deep, plump and very attractive. This variety can be safely recommended for planting on the Lower North and Central Coast. The stud seed sown in comparison with bulk seed produced plants with greater yielding qualities, vigour, and pronounced healthy growth, slightly earlier in maturity.

Palecap Horsetooth.—This is a late maturing, tall-growing variety, averaging 14 to 15 feet in height, with medium to thick stems, carrying large single ears, which droop fairly well at maturity, and are situated about 7 feet high on the stalk. The grain is very deep, narrow, golden in colour, with a pronounced rough dent. The shelling percentage averaged 84. Owing to the good yields during the past season, this variety is worthy of further trial.

Leaming.—This is a mid-season variety, averaging 9 feet in height, with fine stems, few suckers, and drooping ears at maturity, situated 4 to 5 feet high on the stalk, and having good husk covering. The ear is medium to small in size, slightly tapering, and shelling on an average 86 per cent. of grain to core. The grain, tightly held on the core, is dark amber in colour, with a distinct pale yellow cap, and smooth dent. Its ability to resist Leaf Blight was well marked in each district. This variety has yielded consistently for a number of years, and can be recommended for planting early to mid-season on the coast.

Gold Standard Leaming matures earlier than Leaming, and produces a similar grain, except for the colour, which, as the name implies, is golden. Other characteristics are practically identical, but throughout its yielding qualities are not so marked as Leaming, and it is susceptible to Leaf Blight.

Red Leaming.—This variety was tested at Tinonee, and is similar in growth to Leaming, except that the grain is a dark red colour, and the cap not quite so pronounced. Leaming tends to revert to the Red Leaming type, but this should not be encouraged, and in selection the very dark colour is eliminated as much as possible.

Golden Beauty, a local variety from the Manning River, is worthy of further trial on the coast. It is a medium to early or mid-season variety, a tall grower, average height 12 feet, with fine stems, and a small percentage of suckers. The characteristic long thin ears mostly droop at maturity, and are protected with good husk covering. They are carried on the stalk 6 feet high. The grain is dark yellow to pale golden in colour, plump, thick, and firmly held on the thin core. This variety withstood the attacks of Leaf Blight, and outyielded all other varieties at Tinonee.

Golden Nugget.—The outstanding feature of this variety was its remarkable ability to withstand the attacks of Leaf Blight during the past season; at each centre Golden Nugget was practically immune. It is a medium maturer (a little later than Leaming), tall grower, average height 13 feet, with comparatively fine stems, carrying medium-sized ears, a large percentage of which droop at maturity. The husk covering is excellent, and the ears are carried 5 feet high on the stalks. The grain is bright golden in colour, with a high percentage of horny endosperm, which in many cases (especially in grains at the tip of the ear) covers the cap of the grain, resembling the flint type of maize. The shelling percentage is 84, and the grain is packed on a medium-sized core. This variety is recommended for grain, main or late sowing.

Boone County White ranks as mid-season in order of maturity; grows 10 to 12 feet in height, with fairly coarse stalks, carrying ears 6 feet from the ground, which droop at maturity. The husk covering appears to be a little weak, and during the past season allowed the earworm (*Chloridea obsoleta*) and other insect pests to enter freely. The ears are short, cylindrical, and well packed with creamy white grain, having a small cap, and pronounced dent inclined to be pinched. This variety gave satisfactory yields at Tinonee and Paterson, but disappointing results followed at Comboyne on light-textured soil. It is liable to the attack of Leaf Blight. The shelling percentage was 85. This variety is worthy of further trial on different classes of soil.

Reid's Yellow Dent has been given extensive trials in farmers' experiment plots for a number of years, and although it produces ears of excellent uniformity and trueness to type, the yields as a whole have been unsatisfactory. It is a medium early maturer, with slender stalks, each carrying on an average two ears, which droop at maturity. It has a tendency to sucker; grows 9 feet in height, with the ears 5 feet from the ground. The husk covering is weak. The grain is bright golden in colour, narrow, with a slightly pinched dent. The shelling percentage at one centre was 83.

Silvermine.—A medium early maturer (4½ months); grows to a height of 7 to 8 feet, with slender stalks, each carrying, on an average, two ears about 4 feet from the ground. The ears droop at maturity, and are protected with a good husk covering. The grain is thin, narrow, and creamy white in colour, with a rough dent, having the upper extremity projecting as a beak. The grain is well packed and tight on the core. This variety, although yielding well at Tinonee, completely failed at Yarramalong, and gave poor yields at Comboyne. It, however, suffered from the effects of Leaf Blight in the last two mentioned centres. The shelling percentage at one centre was 83. At Comboyne, acclimatised local seed, planted three weeks earlier, gave an increased yield of 36½ bushels per acre above the introduced, and a shelling percentage of 86.

Goldmine.—This variety matures a little later than Silvermine, and its habit of growth is somewhat similar. The grain is narrow, deep, and golden in colour, with the characteristic pinched dent, the upper extremity of which overlaps considerably. The ears are medium in size, and shell 86 per cent. of grain to core. This variety is subject to the attack of Leaf Blight, having completely failed at Yarramalong.

Potchefstrom Pearl is a medium late maturer, good blight resister, tall grower, averaging 12 to 13 feet in height, with coarse stems, carrying large ears, which mostly remain upright at maturity, situated about 6 feet high on the stalk. The shelling percentage averaged 84. The grain is broad, white in colour, with a smooth dent. It yielded comparatively well, and will be given further trial.

Giant White.—On the alluvial soils of Tinonee and Paterson this variety yielded satisfactorily, and also gave a comparatively fair yield at Yarramalong. It is a medium late to mid-season variety, a tall grower, with comparatively fine stems, few suckers, and short stout ears, remaining upright at maturity, and carried 6 feet high on the stalk. The husk covering is good, and at each centre on trial its freedom from Leaf Blight was well marked. The grain is white in colour, with a cream cap, medium depth, packed tightly on the cob, which is filled well, both butts and tips. The dent is pinched, and the shelling percentage averaged 86. This variety is recommended for early sowing on the Manning River soils of moderate fertility.

Craig Mitchell.—This variety was on trial at Paterson, and it promises to yield well on the alluvial soils. It is a tall grower, with coarse stems, carrying large cylindrical ears, remaining upright at maturity, with fair husk covering, and it matures a little later than Boone County White. The ears are situated about 5 feet high on the stalk. The grain is large, broad, white in colour, with a smooth dent. Its ability to withstand Leaf Blight was well marked, and it is no doubt worthy of further trial.

Eureka matures slightly earlier than Golden Beauty, and produces fine stems 12 feet in height, single medium-sized drooping ears, poorly covered, 4½ feet high on the stalk. The grain is bright yellow to golden in colour, medium depth, with slight dent. The shelling percentage is low, only 74 being obtained, but it is worthy of further trial as the yield indicates.

Hickory King.—This well-known variety gave low yields at Comboyne and Yarramalong. It is medium early, producing fine stalks and medium-sized narrow ears, which droop well at maturity. The husk covering is inclined to be weak. Leaf Blight affected this variety to a large degree, and the earworm found no difficulty in making an entry. The grain is broad, shallow, pearl white in colour, and shells 85 per cent. to core. Other varieties are undoubtedly more suitable on some classes of soils, but Hickory King has a reputation for yielding on soils of weak fertility and upland positions, and can be recommended for sowing under these circumstances.

Funk's Yellow Dent is a medium early maturing variety, producing short stalks, carrying drooping ears, with rather weak husk covering. The grain is short, plump, dark amber in colour, with a small pale yellow cap and slightly rough dent. The shelling percentage was 80. The yield was disappointing, but it resisted blight fairly well, and will be given further trial at Comboyne.

Early Yellow Dent.—This variety was the earliest maturer under trial, and grew only 6 feet in height, having medium thick stems, carrying upright short ears, with fairly good husk covering. The grain is plump, shallow, and pale amber in colour, with a small cap. It was noticed that *Fusarium* sp. (Dry Rot) was prevalent in the grain, and Leaf Blight had lowered the yield. The shelling percentage was 82.

Large Yellow Horsetooth.—A local variety under trial at Tinonee gave fair results. It is a medium late maturer, tall grower, with characteristics somewhat similar to Palecap Horsetooth. Its yielding qualities are fair, and it is worthy of further trial for grain and green fodder.

White Horsetooth.—Another local variety under trial at Tinonee; yielded very satisfactorily, and is worthy of further trial. The grain is white, long, and thin, with a decided pinched dent. Other characteristics are similar to Palecap Horsetooth.

Fertiliser Trials.

Manurial tests were carried out in conjunction with the variety trials at three centres, viz., Tinonee, Comboyne, and Yarramalong. In calculating the returns, maize was valued at 5s, per bushel, and the fertilisers as follows:—

	s.	d.			s.	d.	
Superphosphate...	5	0	per cwt.	Nitrate of Soda	22	0	per cwt.
P7...	7	6	,,	Sulphate of Potash (pre-war price)	17	6	,,
Bone-dust ...	8	6	,,	Wellington Rock Phosphate ...	5	0	,,

The fertilisers were spread in the rows at seeding time, except in the case of nitrate of soda, which was applied as a top-dressing six weeks after planting. The results obtained from the use of P7 (equal parts of superphosphate and bone-dust) were most satisfactory at Comboyne and Yarramalong, whilst at Tinonee a financial loss occurred. In each instance it was noted that with the application of fertilisers, and consequent sturdy growth, the damaging effect of Leaf Blight was felt to a much less degree. This was most noticeable at Comboyne and Yarramalong.

Tinonee Plot.

The results obtained last season from the use of phosphates give evidence that the soils of the Manning were not deficient in phosphoric acid. It is worthy of note, however, that a top-dressing of ½ cwt. of nitrate of soda per acre gave an increased yield of 12½ bushels per acre over the unmanured plot, and also that manured with superphosphate at the rate of 2 cwt. per acre. Although P7 gave an increased yield of 1¼ bushels per acre, it was a financial loss, for the extra yield failed to cover the cost of manure.

TABLE II.—Showing Results of Manurial Trial at Tinonee, 1917–18.

Plot.	Manure per acre.	Yield per acre.	Cost of Manure.	Value of Increase, less cost of manure.
		Bushels.	£ s. d.	£ s. d.
1	2 cwt. Superphosphate, and ½ cwt. Nitrate of Soda (top-dressing).	87½	1 1 0	2 1 6
2	2 cwt. P7 mixture	76¼	0 15 0	(—) 0 8 9
3	2 cwt. Superphosphate	75	0 10 0	(—) 0 10 0
4	3 cwt. Wellington Rock Phosphate	72½	0 15 0	(—) 1 7 6
5	No manure	75	......	.....

(—) Signifies loss.

Improved Yellow Dent was the variety used.

Comboyne Plot.

The friable volcanic soil at this centre responded well to the application of fertilisers, and the early growth of manured plots was much more healthy and vigorous than of the others. The manured plots grew 2 feet taller, and gave greater yields. A special mixture, consisting of six parts superphosphate, two parts bone-dust, and two parts sulphate of potash, was given a trial, but did not compare favourably with either superphosphate or P7.

TABLE III.—Showing Results of Manurial Trial at Comboyne, 1917–18.

Manure per acre.	Yield per acre.	Cost of Manure.	Value of Increase, less cost of manure.
	Bushels.	£ s. d.	£ s. d.
2 cwt. P7 Mixture	43¾	0 15 0	2 10 0
2 cwt. Superphosphate ...	41	0 10 0	2 1 3
2 cwt. Special Mixture ...	37	0 16 5	0 14 10
No manure	30¾	......	......

Leaming was the variety used.

Yarramalong Plot.

The results obtained during the past season from the application of phosphatic fertilisers on the light-textured soils at this centre, are very promising. Superphosphate and P7 both gave a marked increase in yield, and proved remarkably profitable. The effect of manure was most apparent during early growth; but throughout the growing period a striking contrast was revealed on comparing the manured and unmanured plots. Included in the trials was a plot of Improved Yellow Dent, sown with stud seed, and manured with 2 cwt. superphosphate per acre, compared with bulk seed manured in the same way. The stud seed demonstrated its superiority in growth, and gave an increased yield of 5¾ bushels per acre, or an increase in value of £1 8s. 9d. per acre.

TABLE IV.—Showing Results of Manurial Trial at Yarramalong, 1917–18.

Manure per acre.	Yield per acre.	Cost of Manure.	Value of Increase, less cost of manure.
	Bushels.	£ s. d.	£ s. d.
2 cwt. P7 Mixture	38½	0 15 0	2 0 0
2 cwt. Superphosphate	34	0 10 0	1 7 6
2 cwt. Superphosphate (Stud seed)	39¾	0 10 0	2 11 3
No manure	27½	......	......

Improved Yellow Dent was used.

Trials of Some Imported Wheats.

J. T. PRIDHAM, Plant Breeder.

In addition to those varieties of wheat that are recommended by the Department, and to those that are the subject of special work in connection with cross-breeding and selection, a considerable number of varieties, known to be doing well in other countries, are imported from time to time, and tested on the different experiment farms in the State, in order that their possibilities under our conditions may be known. Various factors make it necessary for these tests to be conducted for more than one or two years, and sometimes the trials run into several years before it can be determined that a variety is likely or unlikely to be suitable to our conditions. The following paragraphs refer to some of the numerous wheats that have been under trial in recent years.

Huron.—This is a vigorous growing, rather late ripening variety, the result of a cross between Ladoga and White Fife, made in Canada. It has light brown ears provided with awns. Huron has been grown for the last three years at the Cowra Women's Training Farm, and is found to mature too late for the district. At the Wagga, Bathurst, and Glen Innes Experiment Farms it was grown in 1910 and in 1917. At Glen Innes it was favourably reported on, but was found to be too late for Wagga, and somewhat late for Bathurst. The grain is medium hard, and the awns, or beards, are not in favour with most farmers.

Prelude is also a Canadian wheat, believed to be a cross between an Indian variety and Fife. The straw is weak, short, supple, and slender. The ears are white and awned. It is a very early wheat, and rather too short for hay. Prelude has been grown at Cowra Farm for the last four years, at Wagga Farm for three years, at Bathurst and Glen Innes Farms for two years, and it is also being tried at Hawkesbury Agricultural College. In none of these localities have the yields been sufficiently promising to justify our recommending the variety.

Dawson's Golden Chaff is a brown-eared beardless wheat, known in America as a "soft white winter" variety. It is one of the weak-flour class, and is very liable to rust with us. It was grown by Mr. Farrer in 1900, and afterwards at Cowra in the years 1910, 1912, 1916, and 1917. It was also grown at Wagga and Bathurst Experiment Farms in 1916 and 1917, and at Glen Innes in 1916. The wheat matured too late at these farms, and was found to be too subject to rust.

Kharkov, also spelt Karkov or Kharkof, is known in America as a "hard red winter" wheat. It originated in Russia, but is largely grown in America to-day. The variety is apparently identical with Turkey or Turkey Red wheat. Kharkov stands at medium height, with somewhat slender straw and white ears, with fairly fine awns. It was grown in earlier years by Mr. Farrer, and in 1909, 1910, and 1912 at Cowra, in 1910 and 1911 at Glen Innes, in 1911 and 1916 at Hawkesbury Agricultural College, and in 1911 at Bathurst. It is too late for these localities, ripening at the same time as Fife, which it rather resembles.

Defiance.—This is a rather late ripening wheat; it is a crossbred, produced by Professor Blount, of America, and it is very closely related to Blount's Lambrigg. Defiance is grown in Southern California, but with us it is apt to wither at the tip of the ear when the hot weather comes. The ear is awnless and white. The variety was grown at Cowra for seven years up to 1917, and at Bathurst and Glen Innes Farms in 1911 and 1916, being found too late in average seasons.

Emmer.—This is a very distinct species of wheat, with almost solid straw. The ear is strongly bearded in the black-eared type, but the awns are not so stout in the white-eared variety, which is usually grown. Emmer stools heavily, and matures very late. The grain is extremely hard to thresh. Emmer was grown many years ago at Lambrigg by Mr. Farrer, in 1912 and 1916 at Cowra, in 1916 and 1917 at Glen Innes, and in 1916 also at Hawkesbury Agricultural College, Bathurst and Wagga Farms; last year it was tried at Grafton. It is only of use for grazing purposes or soiling, but its slowness of growth renders it unsuitable for this, except in the coldest localities.

Fretes is said to have originated in Russia, and is grown in Algeria and America. It is of the soft grain class, with awns and white ears. The straw has a purple tint, and is very subject to rust and mildew. Since Mr. Farrer's time it was grown at Cowra in 1910, and has been sown there again this season. At the Bathurst and Wagga Farms it was grown in 1910, and at the Nyngan Farm in 1911. We cannot recommend it for any particular purpose.

Propo is a white-eared variety of the soft flour class, with awns. Its yielding qualities have not been such as to warrant our recommending it, and at Glen Innes it is subject to frosting. Propo was grown in recent years at Cowra in each season from 1910 to 1914 inclusive, at Glen Innes and Wagga Farms in 1910 and 1911, and at Nyngan Farm in 1911.

Dreadnought.—This is a European variety, grown in France and England, with awnless white ears and brownish grain. It ripens very late, and is subject to rust. It is a very heavy yielding wheat in a district provided with a cool, long growing season and good rainfall. The flour is low in strength, with an inferior colour, but it would do for blending. It was grown at Cowra in 1911–1914 inclusive, at Hawkesbury Agricultural College and Wagga, Bathurst, Nyngan, and Glen Innes Farms in 1911.

Sensation, also grown in France and England, has white ears with an awn or two at the tip only. Sensation stools heavily, maturing too late for any but the colder districts. It yields an excellent flour of the medium strong class. In 1910, 1911, 1912, and 1913 it was grown at Cowra, and at

Bathurst every year since 1911. At the latter farm it resembles Cleveland, though it does not equal that variety in yield, except in a particularly favourable season. It was tried at Hawkesbury Agricultural College and Wagga, Nyngan, and Glen Innes Farms in 1911, but did not give a good account of itself, being rather liable to rust.

Any introduced variety is given three years' trial before it is discarded. Varieties which, from their behaviour at Cowra, are judged as reasonably likely to succeed at any given experiment farm, are grown for three seasons at that farm. It does not require expert judgment to decide, for instance, that a very heavy stooling wheat is not suitable for the Wagga district, or that it is not practicable to continue with a rust-liable sort in a district liable to the disease.

Trial of Sudan Grass.*

GRAFTON EXPERIMENT FARM, 1917–18.

E. GOLLEDGE, Experimentalist.

AN area of ¼ acre was sown with Sudan grass during the past season at this Farm for the purpose of—(1) plant and seed selection; (2) supplying the growing demand for seed; (3) obtaining additional information.

The site chosen was portion of No. 8 paddock, situated on the banks of Alumy Creek. It is an alluvial deposit, about 6 inches deep in this section, with a clay subsoil.

A renovating crop of field peas was ploughed under some months prior to sowing, and the land allowed to fallow. The soil was well cultivated, being twice ploughed and harrowed, and finally rolled and disc-cultivated.

Sowing took place on the 4th October, 1917, in a well-prepared seed-bed; 8 lb. of seed per acre was sown. The method adopted was to open up shallow furrows 3 feet apart with a mouldboard plough, into which the seed was dropped by hand, and then cover with a light plough and harrow down. No fertilisers were used.

Seventy-six points of rain fell during the day following sowing, which, coupled with a fine seed-bed, ensured a good germination.

The plot came up very evenly, and was well established on the advent of November, with its 11½ inches of rain. Such a precipitation in one month completely waterlogged the soil, but it made no difference to the rapid growth of the grass. The plot was in full flower towards the end of December. Stooling was good. The stems, on the whole, were fine, but the size was determined to a certain extent by the thickness of the "stand." Where it was heavy they were not much thicker than a paspalum stalk, but were twice and even three times as thick where the germination was thinner. A considerable number of plants had thick stalks of the sorghum type, the result of crossing, which was conspicuous throughout the plot. The leaves were fairly abundant, long, and narrow.

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* This report supplements the information on this grass contained in the September issue of the *Agricultural Gazette.*—ED.

The rainfall for the growing period was:—

	Points.		Points.
October, 1917 (from 4th)	264	March, 1918	415
November, ,, ...	1,151	April, ,, ...	291
December, ,, ...	387	May, ,, ...	216
January, 1918	690		——
February, ,, ...	171	Total	3,585

The first growth was cut on the 15th January, 1918, when the plot was 8 feet high, the second growth being allowed to mature seed; by only harvesting seed from the second cutting, a strong hereditary tendency to second growth is developed. It would have been desirable in obtaining the weight of the second growth, to have cut about a fortnight earlier, as the plot had already commenced to form seed, but rain fell almost daily during January.

When harvesting, two average rows from the middle of the plot were weighed, giving 707 lb. from an area of 359 x 9 links, or about $\frac{1}{31}$ acre. The yield works out at the rate of 9 tons 15 cwt. 2 qrs. 21 lb. of green fodder per acre, a highly satisfactory performance. The second crop, on a conservative estimate, would have given a further 3 tons per acre.

The crop cured nicely in three days, with a mean maximum temperature of 87·5 in the shade. No difficulty should therefore be experienced in converting it into hay, for which purpose it seems admirably adapted.

When dry it was placed in an agistment paddock, and all horses readily ate it; not a stalk was left after a few days, although there was an abundance of green succulent pasture grasses at the time. It has a sweet taste, but not to the same extent as the saccharine sorghums.

The second growth came along satisfactorily, the young dormant shoots, which were just showing at time of cutting, making good headway. A height of 5 feet was reached; but it was now late in the season, and the seed ripened very irregularly, only 33 lb. of prime heavy seed being harvested. Leaf blight detracted from the appearance of the second crop.

The heavy rains of November badly compacted the ground, so much so that cultivators were useless. The behaviour of the second crop—which started off under these conditions, as well as receiving considerably below the average rainfall for February—was satisfactory. Under ordinary conditions an even higher return can be expected.

In reviewing these results, four points stand out prominently:—(1) It is hardy; (2) it is relished by stock when made into hay; (3) it is quickly made into hay; (4) it is a heavy cropper.

As a green fodder for this district it is outclassed by maize and sorghums, but as a palatable, nutritious, coarse hay for feeding to stock in winter months, it appears to have great possibilities.

Studies in "Black Disease."

A BRAXY-LIKE DISEASE OF SHEEP.

[Continued from page 662.]

SYDNEY DODD, D.V.Sc., F.R.C.V.S., Veterinary Research Laboratory,
University, Sydney.

Lesions.

THE writer has had opportunity of making over 100 post-mortem examinations of sheep dead from Black disease, in addition to a number incomplete on account of putrefaction. Thirty were held immediately after death, the animals being allowed to die naturally, or being killed. In this, as in many other diseases of the sheep, post-mortem decomposition sets in very rapidly, and consequently, unless the autopsy be held very soon after death, the true nature of the lesions may be obscured by post-mortem changes.

Many writers upon this and allied diseases of the sheep lay stress upon the fact that decomposition sets in rapidly after death. It is a question whether undue emphasis has not been placed upon this fact. In view of the thick covering of wool, which maintains the body temperature for some time after death even on a cold day, one would expect rapid post-mortem invasion of bacteria in the unopened carcase of the sheep and consequent putrefaction.

In a typical case of the disease, the fairly constant post-mortem appearances are as follows:—Engorgement of the subcutaneous vessels; distension of the pericardial sac by a straw-coloured, clear, odourless fluid, which soon coagulates after death into a soft gelatinous mass; a similar liquid, but less constant in its presence and more variable in amount, may be found in the pleural or peritoneal cavities, that in the latter often being slightly turbid; subendocardial hæmorrhages are commonly present in the left ventricle, much less frequently in the right ventricle or upon the epicardium; there is no very pronounced change in the lungs; the lymphatic glands generally are swollen, œdematous, and congested, the changes being most marked in those of the thorax and abdomen; the kidneys and liver are congested, the latter often presenting hæmorrhagic or necrotic areas of varying size up to an inch in diameter (the latter, however, is an unusual size); the spleen is normal in size and consistence; the rumen, reticulum, and omasum are normal in appearance.

Abomasum or Fourth Stomach.—In one or two reports upon Black disease it is stated that the fourth stomach is inflamed in patches. If it is meant that an inflammatory condition of the abomasum is a constant feature in this disease, then that has not been the writer's experience. In quite a considerable proportion of cases examined immediately after death, the abomasum has appeared normal. Occasionally, however, a patchy congestion of the mucous membrane around or near the pyloric orifice was encountered. The areas were irregular, and averaged about an inch in diameter. No necrosis of this viscus has been observed, but recently on two occasions superficial erosions or ulceration of the mucosa of the abomasum have been seen, the erosions—one in each case—being about 1 inch x ½ inch in area and having clear-cut margins. Very occasionally one may find punctiform hæmorrhages scattered over the surface of the mucous membrane, which latter may be œdematous.

Small Intestines.—The most constant and pronounced changes in the alimentary tract appear in the small intestines. Very few cases have been seen without some alterations here. There may be either an intense congestion of the mucosa, or a hæmorrhagic inflammation. On rare occasions actual blood has been found in the lumen of the bowel. The submucosa is often œdematous. The changes are most pronounced in the duodenum and ileum, the intervening portion, the jejunum, being less markedly affected.

The large intestines are, as a rule, normal in appearance.

No muscular lesions have been observed in those cases where examination was made directly after death, except the presence occasionally of a clear, straw-coloured, intermuscular exudate in the floor of the abdomen or elsewhere.

As already mentioned, unless the examination be made soon after death, post-mortem changes will be added to the picture, and may be mistaken for ante-mortem lesions, *e.g.*, the exudates may be quite turbid in appearance, especially that in the peritoneum. Various tissues and exudates may be blood-stained owing to hæmolysis. The kidneys may be more or less softened. (Very little importance can be attached to the consistency of the sheep's kidneys unless the autopsy has been held soon after death, especially in warm weather, as post-mortem softening of these organs proceeds very rapidly, and in a few hours they may be a pultaceous mass.) Gas may be evolved in the heart chambers by the action of cadaver bacteria.

The description of the symptoms, post-mortem appearances, &c., are based upon the writer's observations of sheep seen ill, and which were autopsied immediately after they had been killed or had died naturally, during the seasons 1915, 1916.

Towards the end of May, 1914, the writer was invited by Mr. S. D. Symons, M.R.C.V.S., Chief Inspector of Stock, to undertake investigations into the etiology of Black disease. Work was soon commenced, and continued during the seasons 1915 and 1916, although considerably interrupted in 1915 by absence on military duties.

In 1914 the Black disease season was approaching its end when the work was begun, and although the mortality over a large area had been heavy, no sick animals could be found, in spite of the watching from daylight to dark of some thousands of sheep. Five animals were, however, found dead in the early morning on various days, although on inspection of the flocks overnight no signs of illness had been detected. The nights were cold, heavy hoar frost covering the paddocks till well after sunrise. The animals could have been dead only a few hours at the most when discovered, as their bodies were quite warm.

Pipettes were filled with blood and exudates from the various animals for subsequent experimental work, and portions of organs, &c., were taken for microscopical examination. Also, six sheep were inoculated on the station where the deaths had occurred, with various materials from the dead animals. All of them succumbed as the result.

Inoculation and Feeding Experiments

With various materials, *e.g.*, blood, exudates, liver, kidney, &c., from the six sheep found dead of Black disease, and from the animals inoculated in the field from these natural cases, and also muscle in the experimentally infected cases, 104 inoculation and feeding experiments were performed, viz., forty-three inoculation and feeding experiments upon sheep, forty-four inoculation experiments upon guinea-pigs, and seventeen upon rabbits. (The above includes experiments with various organisms isolated from the different materials.) A summary of the results of the foregoing is as follows:—

Sheep.—Five feeding experiments with mashed-up viscera of animals dead of the naturally acquired disease. Result—negative.

Two feeding experiments with minced muscle from the local lesions of sheep dead as the result of experimental inoculation. The contents of the stomachs of the two sheep were neutralised before the muscle was administered. Result—negative.

Thirty-three inoculation experiments with blood, exudates, emulsions of organs, &c., or cultures of organisms obtained from cases of Black disease, either direct or after animal passage.

Of these inoculations, eight terminated fatally, and twenty-five were entirely negative or resulted in a local lesion with slight systemic disturbance.

Three sheep were fed daily for over a week with young cultures of various organisms isolated from natural or experimental cases, the contents of the stomach being neutralised just beforehand on each occasion. Result—negative.

Guinea-pigs.—All of the forty-four experiments were subcutaneous inoculations into various parts of the body with materials and cultures derived from sources similar to those in the case of the sheep. Twenty-five of these inoculations were fatal, while nineteen were either quite negative or resulted in a local lesion only.

Rabbits.—In these cases also the experiments were all in the form of subcutaneous inoculations with similar materials as above. Six inoculations resulted in death, and eleven were negative.

In some of the foregoing inoculation experiments with bacteria isolated from various cases, lactic acid was added to the inoculation fluid.

Intra-peritoneal injections of emulsions or cultures was not performed, as it was recognised that such would only result in a heavy mortality of the experimental animals, without any corresponding benefit.

To give a detailed account of all the foregoing experiments would be tedious, and, furthermore, apparently unnecessary, as it will be seen that the writer does not consider he has satisfactorily demonstrated that he had produced with any of the organisms, fluids, &c., experimented with, a condition resembling in all respects that of natural Black disease.

It is desired here, when comparing the autopsies of experimental animals with those dead from the naturally acquired disease, detailed in this part of the article, to strongly point out that, in 1914, in each case the latter had been *found dead, i.e.,* the inoculation materials were not taken at the time of or immediately after death in the first instance; and that also during 1914, when the bulk of this preliminary work was performed, the writer had not been able to examine an animal during life, or immediately after death, when affected with Black disease. So that the extent to which post-mortem changes might have masked the original lesions was then unknown.

Summary of Results obtained in 1914.

The subcutaneous inoculation of heart blood from sheep *found dead* of Black disease resulted in death, as also did the inoculation of peritoneal fluid obtained in a similar manner. The principal post-mortem lesions in these experimental cases appeared to be more of a malignant œdema type than of Black disease.

Feeding experiments with minced-up abomasum, intestines, liver, kidneys, &c., were negative.

Two main types of bacilli, both anaërobes, were isolated from the sheep found dead, viz., (1) Braxy type, (2) malignant œdema type.

Inoculation experiments, par-enterally, into sheep of the bacillus of the braxy type, which was isolated from the sheep found dead of Black disease, had various results. Sometimes death, but more frequently only a local lesion with slight systematic disturbance followed.

Feeding experiments on sheep with various bacilli isolated were negative. With guinea-pigs, subcutaneous inoculation of the braxy type of bacillus in young cultures in doses of 0·1 to 0·5 c.c. was invariably fatal within twenty hours, often within sixteen hours. With smaller doses (0·05 c.c.) death might be delayed a few hours.

In a number of the fatal inoculations of guinea-pigs no cultures were made, as death had occurred an unknown, although short, period before discovery in the morning, and obvious post-mortem changes had already occurred.

The total number of experiments performed include those conducted with all the various species of organisms which were, on experiment, found to be non-pathogenic, or whose effects were such as to indicate that they were merely cadaver bacilli.

Remarks.

The principal result of the work performed during 1914 was the isolation of an organism of the braxy type, morphologically and culturally, which was fatal when inoculated subcutaneously in small doses into guinea-pigs, but not to rabbits. Administered in the same way to sheep, it was at times fatal, at others not. It was noted that in these experiments the fatal cases presented a picture rather more approaching that of malignant œdema than that of naturally occurring Black disease. Administration of the organism by the mouth in large and daily doses to sheep produced no evident result.

A bacillus of the malignant œdema type was also isolated and experimented with, but accumulated evidence indicated that it, in all probability, was not the cause of Black disease.

A number of other species of organisms were isolated, both aërobes and anaërobes, but were evidently all post-mortem invaders.

Reasoning superficially, and ignoring certain evidence, one might have arrived at the conclusion that one had succeeded in demonstrating the cause of Black disease, and that if not identical with the braxy bacillus, it at least belonged to the same group; but the weak spot, and a serious one in the train of evidence, was the fact that the organism experimented with had been isolated from animals *found dead.* It had not been proved that any one of the various bacteria, including the braxy type of bacillus, was present, either in the blood, exudates, tissues, &c., of Black disease sheep before the death of the animals. Consequently, no matter how far the work progressed on the lines being carried out, there would always be the objection that there was no conclusive proof that the organism isolated was the cause of the disease, but that, on the other hand, it might be merely one of the so-called "cadaver bacteria."

The plan of the experimental work carried out in 1914 was considerably influenced by the work done on Braxy and allied diseases in Europe, including Great Britain, Victoria (Australia), &c.; and although the weakness of one's position in having to work with the kind of material then available was fully realised from the beginning, yet experiments were carried out fairly extensively in order to see whether, after all, one could reconcile one's doubts and conclusions with the results of other workers on Braxy and its allies. Unfortunately, however, in the great majority of cases that I am cognisant of, the same objection holds good with regard to their conclusions as might be urged against accepting any of those based upon the work hitherto conducted upon Black disease, viz., that their organisms were obtained from sheep that had been found dead, no matter how recent the death appeared to be. In going through the available literature upon the subject, it appears that no one had quite satisfactorily eliminated the doubt that the organism isolated in the various instances, although highly pathogenic upon par-enteral injection, was, after all, either an agonal or a post-mortem invader from the alimentary tract.

Post-mortem invasion of the blood, exudates, and organs of the carcase of a sheep by bacteria from the intestines is very rapid, and agonal invasion by bacteria having the same origin may, and sometimes does, occur. Furthermore, ante-mortem invasion of the blood or liver by organisms having the same origin takes place occasionally. It is well known too, that there are a number of the so-called "cadaver bacilli," many of them anaërobes, normally resident in the alimentary tract, where they apparently are harmless, which when injected subcutaneously in small amount in pure culture will produce serious systematic disturbances, and frequently death; and in such pure cultures the odour of putrefaction often associated with these organisms is frequently not evident.

It will thus be seen that before allocating any special rôle to an anaërobic bacillus isolated from sheep found dead, one has to take into consideration a number of other factors beside those that the organism was isolated, no matter with what care and skill, from such an animal, and that it caused death upon par-enteral inoculation of certain animals. It is this aspect of the question that quite a number of writers upon Braxy and allied diseases in sheep appear not to have taken seriously enough into consideration.

In the investigations conducted by the writer, the mere fact that one had isolated a certain organism which, upon subcutaneous inoculation, caused death, with a certain train of lesions, was not in itself sufficient to prove that the particular organism was the cause of the disease under investigation, even though it agreed with the findings and conclusions of workers elsewhere.

As a consequence of the research work carried out, it was concluded that no results of scientific value could be obtained regarding the cause of Black disease in working with material from animals found dead, no matter how recent the death appeared to be; but that such materials, *e.g.*, blood, exudates, portions of organs, &c., should be obtained from sheep seen alive, and taken immediately the animal had been killed or had died naturally. By this means the doubt as to whether the particular organism, if any, isolated was responsible for the disease or was only a "cadaver bacillus" would be largely eliminated, although, perhaps, in some instances not entirely.

It was not possible to carry out the new plan of operations that year, as the Black disease season of 1914 on the sheep station whence the materials were obtained was practically over when the work was originated.

(*To be continued.*)

PARTURITION OF FARM ANIMALS.

A TUGGERAH correspondent writes:—

> In the *Agricultural Gazette* of 2nd June, 1913, you published very valuable information on the "Parturition of Farm Animals."
>
> At that time cattle were not considered by the general farmer as valuable beasts, and springers were invariably turned out into the bush paddocks to take their chance.
>
> Now, however, the position has changed, and the cow and calf have become a valuable asset to the farmer, but it is surprising the lack of knowledge the average man amongst stock possesses when abnormal conditions occur in parturition.
>
> I would suggest that you republish this information at an early date in your valuable journal, together with any further knowledge available, as I am sure it would be appreciated by all dairymen, stock-owners, and farmers throughout the State.

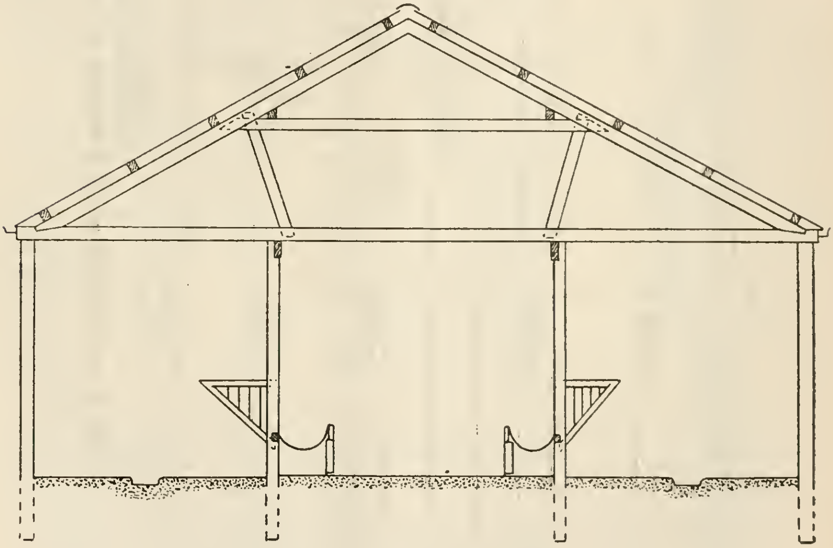
The demands upon the space in the *Gazette* prevent republication of the article in question, but any reader can obtain a reprint without charge by applying to the Under Secretary and Director, Department of Agriculture, Sydney, for Miscellaneous Publication No. 1,648, "Parturition of Farm Animals."

Feeding Stalls for Cows.

C. PEDERSEN, Dairy Instructor.

INQUIRIES have frequently been made to the Dairy Branch for information regarding the best way to build cow feeding stalls, and the attached plan has been prepared as a guide to those intending to erect such stalls. Judging by the number of inquiries, there is evidently a desire on the part of dairymen to go in more for hand-feeding than has been done in the past.

The feeding (not grazing) of dairy stock must appeal to dairymen with increasing force, as dry spells from time to time lessen the fairly large factory cheque; but apart from this, it should be known that to breed dairy stock successfully, the stock—dam and sire—should be in a proper physical condition at all times. This is hardly possible under our very changeable climatic conditions; hence the necessity for making proper provision to feed and care for the dairy herd has a double significance, because it not only means breeding a better class of dairy stock with a low percentage of losses, but a larger and more regular supply of raw material (milk or cream) to the factory.



CROSS SECTION SHOWING MANGERS & PARTITIONS

Fig. 1.

A question that arises when arrangements for feeding in stalls are being considered, is, "Can the milking be done there also?" To feed in one place

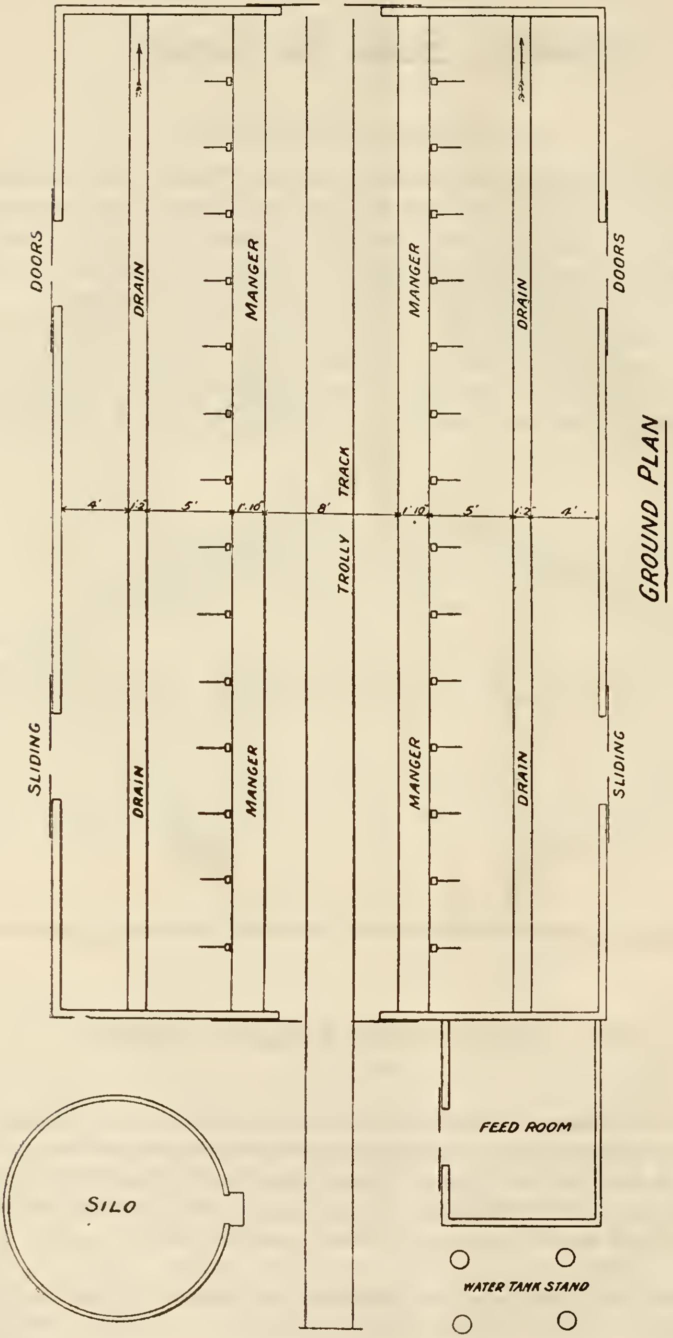


Fig. 2.—Showing Ground Plan of Feeding Stall for Cows.

and milk in another duplicates the work, and, perhaps for that reason, many have refrained from the use of stalls. Unless the stalls are so constructed that they can be kept as clean as the bails, milking cannot be done there. If, however, stalls are so constructed that they can be and are kept clean, there is no reason why the milking cannot be done there also—provided that no dust is raised when the food rations are handled. To prevent this the feed should be well damped and mixed before being brought into the stalls. Unless the risk of contaminating milk through dust arising from this cause can be eliminated, it is not advisable to milk cows in the shed in which they are fed.

The accompanying plan (Fig. 2) is prepared as a guide only, and may be altered to suit individual cases and local conditions. The choice of material used in the erection may be left to the dairyman, with the exception of the floor. This must be hard and impervious to moisture, and should be of concrete, though the floor in the feeding passage can be made of bricks if so desired.

The manger can be made of plain galvanized iron half-round. (See Fig. 1.) The outer side should be a little higher than the inner side; the inner side should be bent over and nailed to the 3 inch x 2 inch rafter let into the uprights, the outside being bent over a 5 inch x 1 inch board, and nailed to same. The board should be supported by a 3 inch x 3 inch post set in the concrete or bricks, and cut in 1 inch for the board to be nailed to; a post every 10 feet should be sufficient for the purpose. A single trough may be made for each cow if preferred, but this style would be more costly; a plain manger is considered preferable. The feeding passage is 8 feet wide, which allows for a good-sized trolley truck, and ample room for handling feed.

The style of partition between individual cows depends on the manner in which they are tied up. A bar is suggested (see Fig. 3), made of ½-inch round iron, bolted to the 3 inch x 2 inch rafter (let into the uprights) in the middle of the stall. A strap round the neck, a bit of chain and a 3-inch ring on the bar will give the animal all the freedom she requires to reach any part of the manger belonging to her, and allow her to lie down as well. Being tied up in the middle of the stall, only a small partition, if any, is required as per sketch. To fix this, cut and let into posts a 3 inch x 2 inch hardwood bracket, and cover same with boards. Two doors in each side of the shed would be an advantage, as it would allow the cows to find their

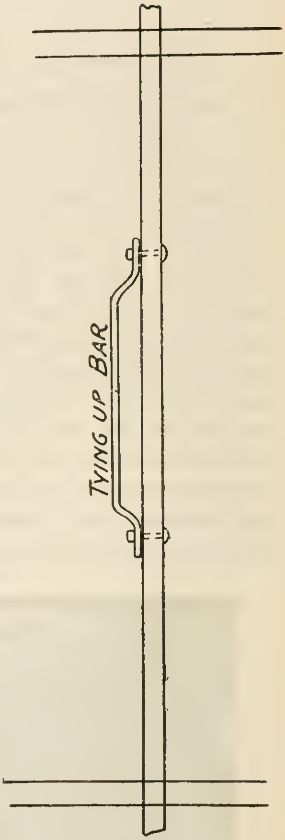


Fig. 3.

stalls readily. This would also facilitate the removal of manure, as a horse and cart could be backed up to the open doors, and the manure at once carted away.

It is necessary for a shed of this kind to have plenty of water for hosing-down purposes, and a tank could be erected, as marked on ground plan, unless water is otherwise provided for. The drains should be large enough to allow a large broom and shovel to be used with freedom. They should have a good fall and a smooth surface, the top edges being well rounded off.

A Convenient Method of Hand-feeding Lambs.

During August an interesting case came under notice on Mr. H. A. Wright's run at Bickham. Owing to a shortage of feed it became necessary to hand-feed ewes and lambs, but it was found that under this treatment the mortality in lambs was heavy. The lambs were therefore taken from the ewes altogether at the age of from six to eight weeks, the ewes being fed separately on lucerne hay, and doing well. The lambs, numbering 225, were yarded right away from the ewes in a small paddock, and fed twice a day on boiled corn and dry bran, and when I saw them they looked remarkably well. The lambs had no milk. The ration was one kerosene tin full of boiled corn and two of bran for each feed. They were fed in a neat trough, 36 yards long, made of corn-sacks cut the long way, sewn together and stretched tightly on two No. 8 wires, to form a trough, with two wires on each side above the trough to prevent the lambs climbing into the feed. Some little difficulty was experienced in getting them to take the feed, and the loss for the first few days was heavy, being about 10 per cent., but after that the loss was not more than 1 per cent.—C. Brooks, Inspector of Stock, Scone.

A convenient method of hand-feeding lambs at Mr. H. A. Wright's station at Bickham.

Value of Silage for Dairy Cows.

RESULTS AT GLEN INNES EXPERIMENT FARM.

R. H. GENNYS, Manager, Glen Innes Experiment Farm.

SILAGE is a great standby and insurance, not only against diminution of the products of dairy cows in lean periods, but against the loss of valuable milkers themselves and of their potential progeny. Unfortunately it is the best milkers that suffer most, for the exhaustion of the system in periods of heavy lactation unfits them for hardship, and when pastures and green crops are again available they are unable to make the best use of them at once because their bodies have first to be built up to normal strength.

Although it is true that a good butter-fat tester is born—not made by feeding—it has been observed on this Farm that a typical dairy cow has tested higher when she came in fat after a good spell than when she came in with only moderate condition after calving. The best dairy cow is not the animal that can maintain her body weight on scant innutritious stuff, but one that possesses a capacious stomach that can digest large quantities of food from which to produce milk. The dairy cow must have some bulky class of fodder; and if a cheap succulent one can be obtained that, with a little dry coarse roughage and a concentrated food, readily makes a balanced ration, then requirements for keeping the milk supply at a fair level have been met. Silage answers these purposes well, being inexpensive, palatable, and nutritious.

For hay-making good weather conditions are quite necessary; but when ensiling a crop—or even weeds—a farmer is largely independent of the weather, and sometimes the product is benefited by the addition of moisture. Some of the best silage produced on this Farm has quite lately been opened up after three years, and like good wine, it appears to have improved with age. Silage acts as a laxative when other foods without it or its equivalent often produce constipation. It should not be fed sparingly to milking cows once their systems have become accustomed to it, which should be in a few days. It should be given in bulk at the rate of 30 lb. to 40 lb. per cow per day, and should form the nucleus to which other foods are only added to complete the ration. To dry cows it can be fed by itself, but it is all the better with a little straw chaff, or failing that an old straw stack to pull at. Nothing, perhaps, helps the digestive organs of cattle more than plenty of chewing material, and in silage we have something that assists the gastric juices to exercise their best functions in dry and cold periods.

It is not argued that silage is equal to sweet green pastures and green fodder crops; but if it can materially help to keep the milk flow at a good level in times when both milk and butter are dear, and still maintain the stock fit and well, then it should have a permanent place on all dairy farms of any size. On the Tablelands, too, where for practically five months of the year there is little or no grass for cattle at a time when good prices prevail for dairy products, it is valuable indeed. Winter calves, too, can be reared when skim-milk is plentiful, and are ready to wean when the young grasses are available in the spring. It is worth remembering that calves reared in winter are less prone to disease than those reared in summer. Anything that tends to prevent losses in stock and their products should be well considered, for it is obvious that dairying rests on a surer basis where plenty of fodder is conserved.

Several writers state that silage should not be fed to young service bulls, and this has been confirmed here in one case. It is excellent for keeping ewes in health for lambing, and for the production of milk when pastures are dried up. It may be used soon after packing in the silo, but is better if it can be kept for, say, two months before use. No weights are used here to compress the silage, but when finishing filling the silo, damp straw cut up and trodden may be put on top by the blower with good effect.

May to September inclusive are generally considered the hardest for cattle on the Northern Tablelands, and the figures below give practical illustration of the value of this rough fodder. The quantity of each food supplied during those months for three years, the milk and butter per month produced therefrom, and also the rainfall for each period are shown. The conditions in the first two years cannot be said to have been unfavourable as winters go here, but frosts always dry up the natural pastures very much and leave little of a succulent nature for cattle. The last period mentioned has been decidedly one of the worst, if not the worst, recorded for the district, with only 470 points of rain for the five months; it is specially to be noted not only for its lack of rain but for the extraordinary number of frosts in succession. It will be seen that the average per cow for September is more than half a pound of butter better than in May, although the drought was so continuous and severe. It might be mentioned that two of the cows that were dried off in September had been milking for twelve months and fourteen months respectively. An aged cow named Barberry was fed for about a month before calving with straw and silage, and when she came into milk in July she received 10 lb. straw chaff, 30 lb. silage, and 6 lb. bran per day; her production on that ration was actually 951 lb. milk, yielding 44·5 lb. butter per month for July, August and September.

The following table shows the average quantity of fodder supplied per cow per day in the periods May to September (inclusive) in the three years:—

	1916.	1917.	1918.
	lb	lb.	lb.
Silage	40	33	30
Bran	4	7½	6
Chaff	6	11½	10

The above quantities were divided into two parts for the morning and evening feeds.

Rainfall for the three periods:—

	1916. Points.	1917. Points.	1918. Points.
May	115	54	40
June	355	153	26
July	308	147	71
August	317	157	262
September	150	472	71
Total...	1,245	983	470

It might be stated that the April fall in the winter of 1918 was only 12 points.

The following table shows the average quantity of milk and butter for each cow for the months in each period, May, 1916, being omitted, as in that month the cows were fed on a green fodder crop and not on silage.

	1916.		1917.		1918.	
	Milk.	Butter.	Milk.	Butter.	Milk.	Butter.
	lb.	lb.	lb.	lb.	lb.	lb.
May	......	......	639·85	31·71	487·50	24·40
June	749·40	34·94	609·75	34·96	381·91	17·31
July	558·46	27·81	633·66	30·21	667·94	34·87
August ..	590·53	28·21	677·40	34·09	619·85	29·81
September ...	597·96	26·02	688·77	30·26	577·45	24·96

Note.—In June, 1918, the average per cow was low owing to no fresh cows coming in, whilst in the following month of July there was a sharp increase on account of an unusual number of cows calving.

"ELEPHANT" GRASS AT MACKSVILLE.

MR. WM GOW, of Craig Rossie, Macksville, in further reporting on this fodder crop on 20th September, 1918, states that the winter there was a most severe one—one of the coldest within the memory of the oldest inhabitant. Although this bleached the leaves of the Elephant grass, and caused a great many of them to fall off, still when chaffed the stems were quite green and juicy, and the horse and cows ate the fodder greedily.

When the stalks get old the stock do not care much for it, but when it is chaffed they are very fond of it, and he is quite satisfied that it is a milk producer, unlike the "cow cane."

He advises that it should be planted on the highest ground available, where it is less likely to be cut down with the frost.

It makes good, sweet-smelling hay if cut when about 3 or 4 feet high. It is a very valuable fodder to grow for chaffing for all kinds of stock during the winter months when feed is scarce, but unless cut when young and made into hay it is too coarse for stock.

He prefers it to "cow cane," and is planting a lot of it this year.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1917–18.

Southern Districts.

H. C. STENING, Inspector of Agriculture.

DURING the season 1917–18, potato experiments were conducted at three centres in the southern districts. The following are the names and addresses of the farmers who co-operated with the Department in carrying out the experiments:—

J. G. Downie, Wolseley Park.
H. and R. Heinecke, Tumbarumba.
E. M. Herring, "Sheen," Batlow.

The experiments comprised a variety trial, a fertiliser test, and a spacing test at each locality.

On the whole the season in the southern districts was a favourable one for potato-growing. The fallows were well supplied with moisture when planting was begun at Batlow on 20th November, and immediately succeeding planting, rain fell for four days, 374 points being registered. It is largely attributable to the continuous rains subsequent to planting, that the germination at Batlow was unsatisfactory. The planting of the plots at Tumbarumba was delayed until 29th November, and a much better germination resulted.

A dry spell was experienced during the early part of February, which caused the crops to wilt, and there was much apprehension in regard to the prospects of the crops. Fortunately the situation was saved by a good fall of rain on 20th February, but the yields of the early maturing varieties, which were at a more advanced stage of growth, evidently suffered as the result of insufficient moisture at this period. The distribution of the rainfall during the growing period is shown in Table A.

TABLE A.—Showing Rainfall during Growing Period.

Month.	Tumbarumba.	Wolseley Park.	Batlow.
1917.	Points.	Points.	Points.
November	6*	... ..	374†
December	244	129	295
1918.			
January	224	256	246
February	288	263	239
March	539	449	425
Total	1,301	1,097	1,579

* From 29th November. † From 20th November.

Otherwise the season was most favourable, frosts holding off till well into winter. It is quite the usual experience for the crops in these districts to be cut by frost towards the end of March.

The growing crops at Batlow were severely attacked by Potato Moth, which checked the growth of the crops, and seriously reduced the yields. As the crops were well hilled, the tubers escaped much damage.

Soil and Cultural Notes.

Tumbarumba.—The soil was a chocolate loam of basaltic origin, which was cropped for the first time. It was ploughed 5 inches deep and harrowed in the middle of September; cross-ploughed 8 inches deep and harrowed in the middle of November. Planting took place on 29th November, the sets being placed 4 inches deep and 18 inches apart, in rows 2½ feet apart. The land was harrowed after planting, and the growing crops were intercultivated and slightly hilled.

Wolseley Park.—The soil was a red loam of slate derivation which had not been cropped previously. It was ploughed 8 inches deep on 24th July and harrowed; disced 6 inches on 20th September and harrowed; ploughed, and the seed planted 5 inches deep on 1st December, the sets being placed 18 inches apart in rows 2½ feet apart. The land was harrowed after planting, and the growing crops intercultivated and hilled slightly. The tubers were affected with Potato Scab.

Batlow.—The soil was a basaltic loam, which had been cropped with potatoes two years previously. The land was ploughed and harrowed the first week in October, cross-ploughed and harrowed on 23rd October; ploughed and the seed planted 5 inches deep on 20th November, the sets being placed 18 inches apart in rows 2½ feet apart. After planting the land was harrowed, and the growing crops were intertilled and well hilled. There was a large percentage of misses, attributable to continuous rains subsequent to planting. Moth attack seriously affected the yields.

TABLE B.—Showing Results of Variety Trials, (manured with 2 cwt. Superphosphate per acre.)

Variety.	Tumbarumba.		Wolseley Park.		Batlow.	
	tons	cwt.	tons	cwt.	tons	cwt.
Factor	14	5	10	0	5	10
Surprise	14	16	9	6	...	
Up-to-Date	14	4	8	19	4	4
Coronation	14	14	7	5	4	12
Manhattan	12	3	4	15	3	18
Carman No. 1	9	15	4	7	3	9
Queen of the Valley ...	6	13	4	1	3	13
Early Manistee	8	7	1	17	2	5

The yields obtained from the plots at Tumbarumba were exceptionally heavy, those resulting from the plots comprising the manurial experiment and spacing test being considerably higher than those of the variety trial, and constituting a record for the experiment plots. The production of tubers was so great that some were exposed above the surface of the soil and damaged by frost. The yield of 10 tons at Wolseley Park is the best yet obtained from the plots on the slate soils of that district. At Batlow the yields suffered as the result of poor germination and moth attack.

Details of Varieties.

The highest average yield was returned by *Factor*, which was tested for the first time on the experiment plots. It was top-yielder at Wolseley Park and Batlow, and was 11 cwt. short of the top yield at Tumbarumba. It is a white-skinned variety, of very vigorous growth.

Surprise was tested at Tumbarumba and Wolseley Park, being the heaviest yielder at the former centre, and second best at the latter. Evidently the season suited it, for the results during the two previous years were not very satisfactory. This variety is remarkable for the fewness of tubers of unmarketable size produced ; in fact, there is a tendency towards the production of very large tubers that are hollow in the centre. To overcome this, the sets should be planted no more than 15 inches apart, which will result in heavier yields of better quality being produced.

Up-to-Date has consistently returned satisfactory yields on the experiment plots in the south. It has a white skin, with few and shallow eyes.

Coronation upholds its reputation as the most consistent yielder for these districts. At Tumbarumba it was only 2 cwt short of the top yield, and at Batlow it was second heaviest.

The yields of the early maturing varieties *Early Manistee* and *Carman No.* 1, are disappointing when compared with those of these varieties in previous years. The low yields on this occasion, however, are attributable to the dry spell in February.

Manhattan has performed better than in previous years, and is deserving of further trial.

Queen of the Valley has returned very unsatisfactory yields in comparison with other late maturing varieties, not only on this occasion but also in previous trials. There are also complaints regarding its culinary qualities, and as far as these districts are concerned it may well be discarded.

Manurial Experiments.

Fertiliser tests were carried out in each locality, Coronation being the variety used for the purpose. In each case one plot was planted without manure, and others received applications of fertiliser as follows :—

3 cwt. per acre P7 mixture, consisting of 1½ cwt. superphosphate and 1½ cwt. bone-dust.

2½ cwt. per acre P5 mixture, consisting of 2 cwt. superphosphate and ½ cwt. sulphate of potash.

3 cwt. per acre superphosphate.

2 cwt. „ „

In every instance the fertilisers were spread by hand along the drills.

TABLE C.—Showing Results of Manurial Experiments.

Manure per acre.	Tumbarumba.		Wolseley Park.		Batlow.	
	tons	cwt.	tons	cwt.	tons	cwt.
No manure	14	10	6	2	4	14
2 cwt. Superphosphate ...	14	14	7	5	4	12
3 cwt. ,, ...	16	18	7	0	5	0
2½ cwt. P5 Mixture ...	16	5	8	11	4	18
3 cwt. P7 ,, ...	19	7	9	17	5	17

At Tumbarumba and Wolseley Park substantial increases resulted, while at Batlow the manure had not such an appreciable effect on the yields, 2 cwt. superphosphate failing to return an increase. As a rule the soils at Batlow respond well to applications of fertiliser, and possibly on this occasion the heavy rains subsequent to planting depreciated the value of the manure. The increases are set out more clearly in Table D, from which it will be seen that 3 cwt. of P7 mixture returned the largest increase at every centre.

The values of the fertilising applications are as follows:—

	£	s.	d.
3 cwt. P7 mixture	1	2	6
2½ cwt. P5 ,, ...	0	18	6
3 cwt. superphosphate	0	14	7
2 cwt. ,, ...	0	9	9

TABLE D.—Showing Increase per acre due to Manure.

Manure per acre.	Tumbarumba.		Wolseley Park.		Batlow.		
	tons	cwt.	tons	cwt.		tons	cwt.
2 cwt. Superphosphate ...	0	4	1	3	(—)	0	2
3 cwt. ,, ...	2	8	0	18		0	6
2½ cwt. P5 Mixture ...	1	15	2	9		0	4
3 cwt. P7 ,, ..	4	17	3	15		1	3

(—) Signifies decrease.

TABLE E.—Showing Value of Increase per acre.

Crop valued at £6 per ton.

Manure per acre.	Tumbarumba.			Wolseley Park.			Batlow			
	£	s.	d.	£	s.	d.		£	s.	d.
2 cwt. Superphosphate ...	1	4	0	6	18	0	(—)	0	12	0
3 cwt. ,, ...	14	8	0	5	8	0		1	16	0
2½ cwt. P5 Mixture ...	10	10	0	14	14	0		1	4	0
3 cwt. P7 ,, ...	29	2	0	22	10	0		6	18	0

(—) Signifies decrease.

TABLE F.—Showing Profit due to Manuring.

Manure per acre.	Tumbarumba.	Wolseley Park.	Batlow.
	£ s. d.	£ s. d.	£ s. d.
2 cwt. Superphosphate ...	0 14 3	6 8 3	(—) 1 1 9
3 cwt. ,, ...	13 13 5	4 13 5	1 1 5
2½ cwt. P5 Mixture ...	9 11 6	13 15 6	0 5 6
3 cwt. P7 ,, ...	27 19 6	20 7 6	5 15 6

(—) Signifies loss.

Table F shows that an application of P7 mixture easily returned the highest net profit at each locality. Superphosphate alone was not so satisfactory as in the previous season's tests, when 2 cwt. returned the highest average net profit.

Spacing Tests.

At each centre a test was conducted to determine the best distance apart for the planting of sets. Coronation was the variety used in each instance, and the sets, averaging about 2 oz. in weight, were planted at 12 inches, 15 inches, 18 inches, 21 inches, and 24 inches apart in the rows. At Tumbarumba and Batlow the results of the plot planted 18 inches apart are not comparable, and are therefore not included in the table.

TABLE G.—Showing Results of Spacing Tests.

Drills 30 inches apart. Average Weight of Sets, 2 oz.

Space between Sets.	Tumbarumba.	Wolseley Park.	Batlow.
	tons cwt.	tons cwt.	tons cwt.
12 inches	19 14	11 9	6 10
15 ,, ...	20 12	8 16	7 2
18 ,, ...	......	7 5	......
21 ,, ...	19 2	6 15	6 4
24 ,, ...	19 1	6 6	5 5

The results are in favour of the closer plantings; at Tumbarumba and Batlow the best yield resulted from a 15-inch planting, while 12 inches apart was the most successful planting at Wolseley Park. Assuming the average weight of sets to be 2 oz., it will take 15½ cwt. of seed to plant an acre with sets 15 inches apart, in rows 2½ feet apart. It is intended to conduct further tests upon these lines, but in the meantime 15 to 18 inches may be regarded as the most satisfactory distance apart to plant. Wider spacings result in lower yields, and the potatoes are inferior in quality, being large and coarse, and frequently hollow in the centre.

Wood-ashes as a Source of Potash.

F. B. GUTHRIE.

As potash salts are at present practically unprocurable, a source of this important manurial ingredient must be sought for elsewhere.

The material most readily available to the farmer, and which contains potash salts in fair quantity and in a readily available form, is wood ashes.

As this product is usually recommended as a substitute for sulphate of potash in the formulæ for fertilisers published by the Department, it is important to realise just how far, and in what way, wood ashes can be used for this purpose.

In the first place, wood ashes contain lime, and on this account must not be mixed with manures containing organic nitrogen, such as dried blood or bone-dust, nor with sulphate of ammonia, since, in these cases, ammonia is given off, and the nitrogen, for the most part, lost. Wood ashes should be applied separately, and preferably two or three weeks before the other ingredients.

As its lime content is usually fairly high, it is particularly useful on sour soils.

In the second place, the percentage of potash is exceedingly variable, and in wood ashes obtained from the ordinary local hardwoods nearly always low.

Farmers must therefore not be misled by general statements as to the value of wood ashes as a source of potash. Applications of about 12 to 15 cwt. are generally recommended, instead of 1 cwt. sulphate of potash; but this quantity of the usual mixed ashes by no means supplies all the potash provided by 1 cwt. sulphate of potash.

From a number of analyses of the ash of hardwood timbers, made by the Department, a list was published in the *Farmers' Handbook*. From this it will be seen that the potash content varies from 0·7 per cent., in the case of spotted gum, and about 1·5 in the case of ironbark and box, up to 4·17 to 5·25 per cent. in the case of red gum and bloodwood respectively. These figures are from individual samples, and will vary with different trees, and also with the age of the tree and the part from which they are derived.

Also, the potash content will be diminished if the ashes have been exposed to rain, as the potash salts are very soluble and easily leached out.

The following analysis, made by Mr. C. R. Barker, of this Department, is of interest as representing an average sample of carefully prepared and unleached mixed hardwood ashes.

The sample was forwarded by Mr. H. C. L. Anderson, and was collected under his directions from the furnace of one of the saw-mills on the North Coast.

The ashes were taken clean from the furnace, and absolutely dry. The unburnt charcoal was sifted out, and the sample so obtained may be considered as typical of the ashes of mixed North Coast hardwoods.

ANALYSIS of Sample of Ashes of mixed North Coast hardwoods.

Unburnt carbon = 11·63 per cent.
Insoluble matter = 60·96 " "
Potash (K_2O) = 1·34 " "
Undetermined = 26·07 " "

100·00

If wood ashes of the above composition are used as a substitute for sulphate of potash, it would be necessary to apply 2 tons in the place of every hundredweight of the potash salt, in order to supply the same amount of potash.

In the above sample the lime was not determined, but an analysis of mixed hardwood ashes quoted on page 846 of the December issue of the *Agricultural Gazette* for 1916, and in *Farmers' Bulletin* 115, page 17, gives 24 per cent. carbonate of lime. If it is assumed that the sample under discussion contains about the same amount, its probable composition will be—

Unburnt carbon .. .. = 11·63 per cent.
Insoluble matter .. .. = 60·96 " "
Carbonate of potash (K_2CO_3) = 2·00 " "
Carbonate of lime .. .. = 24·00 " "
Undetermined (iron, alumina, magnesia, soda) = 1·41 " "

100·00

The following figures indicate the content of potash (K_2O) of samples of wood-ashes from mixed timbers (varieties unknown) made at different times in the Laboratory for individuals:—3·46, 1·57, 0·06, 5·04, 4·65, 0·27, 0·83, and 0·30 per cent.

The following analyses recently made of wood-ashes from various timbers specially burnt for the purpose by the Forestry Department will serve further to show the variations to be expected in the potash-contents of the same timbers, and even of individual specimens of the same timber. (See also *Agricultural Gazette*, December, 1916, already referred to):—

Tree.	Unburnt Carbon.	Potash (K_2O).	Tree.	Unburnt Carbon	Potash (K_2O).
	per cent.	per cent.		per cent.	per cent.
Myall	17·10	1·36	Mountain Ash ...	20·02	9·23
Yellow Box... ...	16·74	0·28	Blue Gum	26·14	5·17
Mountain Gum ...	30·60	6·88	Grey Box	24·80	2·95
Mountain Ash ...	30·57	5·57	Grey Ironbark ...	22·89	0·13
Woollybutt	17·60	6·36	Red Ironbark ...	21·32	1·02
Yellow Stringybark	9·70	5·59	Forest Red Gum ...	47·03	1·58
Brush Box	24·14	1·78	Grey Gum	24·66	0·26
Spotted Gum ...	20·02	4·70	Blackbutt	40·31	2·04
Forest Oak	27·45	5·09	Turpentine... ...	22·17	1·88

None of the figures here quoted can be accepted as representative of the timbers specified, as the burning has not been conducted uniformly, the variations in the unburnt carbon are considerable, the temperatures at which the wood was burnt vary, also the exposure of flame.

Exceptionally high figures for potash were obtained in a sample of the ash of *Pinus insignis* (from the Forestry Department), which gave 18·67 per cent. potash, and from the ash of Bracken fern, which contained 16·71 per cent.

THE NOMENCLATURE OF TAGASASTE.

In an article on Tagasaste by me, published in the *Agricultural Gazette* for 1915, p. 883, three forms of *Cytisus proliferus* are figured, viz.:—

1. Tagasaste (*C. proliferus* var. *palmensis* Christ.).
2. Escabon de Canaria (*C. proliferus* var. *Canariæ* Christ.).
3. Escabon de Tenerife (*C. proliferus* var. *angustifolius*).

In a paper dealing with Tagasaste and Gacia (*Kew Bulletin*, 1918, p. 21), J. Hutchinson has raised two of the above varieties to specific rank.

The nomenclature now proposed is:—

1. Tagasaste (*Cytisus palmensis* Hutchinson).
2. Escabon de Canaria (*Cytisus Perezii* Hutchinson).
3. Escabon (*Cytisus proliferus* L.f.), which includes the varieties *angustifolius* and *nanus* of O. Kuntze. It will thus be seen that this Escabon includes Escabon de Tenerife, as in No. 3 above.

In an article in this *Gazette*, 1918, p. 283, "Tagasaste and the Gacias growing in the Botanic Gardens, Sydney," by Mr. E. N. Ward, a reference is made to the var. *palmensis* Chr. as above, which should now read, *Cytisus palmensis* Hutchinson. On p. 284, *loc. cit.*, the Gacia (*Cytisus stenopetalus* Christ.) is given, by a slip, the authorship of Webb and Benson.—J. H. MAIDEN.

WATERING THE MILK THROUGH THE COW.

On account of the large number of experts and chemists who still believe that it is possible to water the milk by giving large quantities of water to the cow, and the danger of injustice to dairy farmers attaching to that belief, M. Porcher, Professor at the Veterinary School of Lyons, in a recent article recalls the physiology of lactation, insisting on the fact that milk is secreted, not excreted. The researches, experiments, and conclusions of several investigators (chiefly Frenchmen) are quoted. The article concludes that watering the milk through the cow does not exist, that it is nonsense, and that it could not be used as the basis for any reasonable judicial decision.

Poultry Notes.

NOVEMBER.

JAMES HADLINGTON, Poultry Expert.

THE hatching and rearing season has produced mixed results; while many have experienced both good hatchings and rearings others have had the reverse in one or the other, and many in both. This non-success has not been confined to small plants or improvised equipment, but has occurred in some of the larger and better equipped farms. In some cases the poor results are attributable to known causes, while in others the causes of failure were more or less obscure. For the further guidance of operators it may be well to point out some of the more prominent causes of failure. In regard to bad hatches, some of the cases coming under notice were in all probability caused by errors in feeding the stock birds. A most noticeable error was that of feeding too much nitrogenous matter. In some cases about three times as much meat, blood, or other meal was being fed as was required to properly balance the ration, as set out in last month's notes. In addition to which, other highly concentrated foods were being fed. In some of these cases the hatching results were as low as 10 per cent. of the eggs set, and no other cause could be detected. This is in accordance with what experience has proved, as, for instance, where too much slaughter-yard offal has been fed.

Another fruitful cause of partial failure has been the want of attention to the male birds in the way of giving a little extra food, and keeping them free from vermin.

Errors in the working of the incubators were responsible in many cases, the two most frequent mistakes being cooling off the eggs too long in the early stages, and failure to test the thermometers at the commencement of the season. These matters were dealt with in the Poultry Notes for last June.

In regard to failures in brooding, the most common mistake made, and which resulted in much loss, was omitting to maintain proper warmth in the various stages of brooding. Many cases came under notice where the temperature had been reduced too rapidly, and the chickens were being brooded at a temperature far below what was required for their age, and strange to say, in many of these cases, the operators were under the impression that they were giving too much heat. This is one of the fallacies that have crept into current ideas on brooding, and it is responsible for the loss of many thousands of chickens. The argument that the chickens can be brooded without heat does not hold good in these cases, because if heat is to be given it must be in sufficient volume to allow plenty of ventilation and result in the chickens spreading out. It should, however, be remembered that provision should always be made in the brooding arrangements to allow of the chickens getting away from the heat when it becomes too great. Another common cause of trouble was the failure to realise what is ample ventilation. In some cases coming under notice all the ventilation allowed was a series of small holes in the side of the brooder. This was, of course, courting disaster.

Cases of faulty feeding of chickens were also met with. In some cases bread was being soaked in liquid, and fed to the chickens in a sloppy mass. Such feeding is likely to result in bowel trouble. Another error that might be mentioned is the feeding of too much charcoal to chickens. The practice of putting this material in the food is a pernicious one, and based upon an altogether fallacious idea. This material should not be put into the feed; but, if used at all, should be put into receptacles where the chickens can help themselves, and not be forced to eat it. The value of charcoal is much overrated; it has its uses, but it is certainly being much abused at the present time. The effect of mixing charcoal in the food is to cause impaction of the bowels. Chickens kept under good brooding and sanitary conditions are not dependent upon charcoal to keep them in health, as appears to be a growing idea among chicken rearers.

To those who read these notes regularly, it may be said that such requirements have not been overlooked by the writer, and anything of vital importance which it would be advisable to feed to chickens would not have been lost sight of, and would have been advised.

Disease among Chickens.

During the present rearing season a large number of cases of suspected disease among chickens have been submitted to the Department for pathological examination. Many, of course, were of the class where the trouble was clearly attributable to faulty brooding, but quite a number have proved to be cases of coccidiosis. It will be remembered that during the last two years mention has been made in these notes of the increasing number of cases of this disease coming under observation. This is probably not so much due to the increase of the disease as to the fact that more specimens have been submitted for examination, and as pointed out at the time of the first cases being found, it was in all probability more widely distributed than was generally supposed. This has proved to be the case, and it is a disease with which poultry farmers have to reckon seriously, as it has been found in almost every district from which submissions have been made. It therefore behoves poultry farmers to be on the lookout for this disease and to take precautions against it. The following are the simple recommendations issued by the Department:—

Advice regarding Coccidiosis.

Remedial measures are of no use; preventing the spread of the disease is the only thing to rely upon.

Floors of brooder-houses or other indoor places that have been occupied by chickens having had coccidiosis, should be thoroughly sprayed with a mixture of formalin, glycerine, and water in the proportions of 4 oz. of each of the former to 1 gallon of the latter. The first spraying should be done soon after the chickens have been removed from the place, and another at a later stage, before the brooders are again put into use.

The small outside runs usually attached to the brooder-house should be subjected to a thorough cleaning up, and any woodwork on the ground sprayed as above. A depth of from 4 to 6 inches of earth should be removed from these runs, the earth being taken to some place where no fowls are run, or likely to be run in the near future, or buried at least 2 feet under ground. The excavated runs should then be exposed to the sun and weather until near the time when they are required for next season's chickens; fresh earth should then be put in and well rammed to form a surface.

Yards in which affected chickens have been run in the second stage after leaving the brooders should be sprinkled with freshly-slaked lime and left to rest for a while. Before putting in next season's chickens, the lime should be swept off the yards and taken away. The floors of the houses attached to such yards should be sprayed in the manner recommended for the brooder-houses.

Observations kept on a number of farms upon which coccidia had been found go to show that where the above recommendations have been faithfully carried out they have been effective in preventing a recurrence of the disease the following season.

Pulmonary Aspergilliosis.

This is another disease caused by one of the common moulds (*Aspergillus fumagestes*) that has been found among chickens, the effect of which is to cause a kind of pneumonia which breaks down the lungs. The predisposing causes to an attack are, as with other diseases of chickens, chills and lowered vitality from any cause. The use of mouldy chaff, straw, or other substances of this nature are likely to encourage the disease. The best material to use is sand simply scattered on the floor.

As in the case of coccidiosis, remedial measures are useless. Precautions in the direction just indicated should be taken to prevent a recurrence.

Apathy in Cow Testing.

To show the apathy that exists among farmers in some districts of Victoria Mr. R. T. Archer, Senior Dairy Inspector, in his annual report on the Testing of Pedigree Herds for the year ending 30th June, 1918, mentions the following incident, which occurred at a clearing sale recently. It was a sale of pure Jersey cattle, which were being tested under the Standard Herd Test scheme. All the old rubbish about the place, broken harness, and old iron were carefully collected and put into heaps. These lots all sold readily at many times their full value. At last a four-bottle Babcock tester, with acid and glasswares all complete, was offered, but not a bid came for this lot. The auctioneer, trying hard, said, "Anyone give a pound for it?"; but there was no response "Anyone say 10s.——5s.?" "Anyone give a bob for it?" and still no reply. "Anyone have it as a gift?" and he understands that no one would even take it. The owner had no use for it, as the Government was testing his cows. Is there any evidence that things would have been better in New South Wales?

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

SINCE the commencement of this movement in 1911 highly satisfactory progress has been made, as will be observed on reference to the long list of country branches, and on perusal of the notes of meetings of the various branches published herein from time to time.

The main objects of this organisation are to impart agricultural education to farmers by means of lectures and demonstrations by departmental officers, and to encourage farmers to assist one another by gathering together regularly and exchanging their ideas and experiences, principally as regards local conditions, and, of course, regarding agriculture generally.

Farmers are invited to join the local branch, and can do so by getting into touch with its honorary secretary.

In districts where no branch exists, farmers are asked to co-operate with the Department in endeavouring to establish a branch. Full particulars regarding the usual method of procedure, &c., will be furnished on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Notice to Honorary Secretaries.

It is important that regular monthly meetings should be held, and that a record of the meetings of the branches should be inserted in the *Agricultural Gazette.* Honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 14th to ensure insertion in the following month's issue.

Each branch when formed is supplied with a set of available *Farmers' Bulletins,* and from time to time new bulletins are sent to the secretaries for addition to the files. In addition to this, individual members can also procure copies of any bulletin or publication that may be of interest to them in their particular branch of rural industry, by applying for the same through the secretary of the local branch.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of the common insect pests of the district, and collections are cased as required. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Formation of Libraries.—It is suggested that each branch should arrange to establish a library for the use of members; it is thought that this would be a capital way of expending surplus funds.

Secretaries of any branches which may decide to form a complete library are invited to communicate with the Department in the matter, and they will be furnished with an appropriate list of standard works.

Demonstrations in use of Explosives.—A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Field Assistant. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, or perhaps the failure of the writer of a promised paper, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion:—

> Farmers frequently complain that certain varieties of wheat (and of other crops) are not yielding as well as in the past. Are you growing any varieties to which this seems to apply, and have you thought of a possible reason? Do you consider that a variety of wheat grown continuously for years without selection will maintain its cropping capacity? Have you attempted to select the best yielding plants, and to propagate them, or do you think there is a better method?
>
> How long should a cow be kept in milk? For the stud herd it is generally considered wise to limit the milking period to nine months, but for the dairy herd what interval do you allow between drying-off and calving? What effect do you think has the practice of milking right up to calving upon the calf, and on the milk yield of the cow herself?
>
> In what condition do you think early summer fruits should be when picked for distant markets? Have you tried picking when the fruit is matured, but still on the green side? Do you propose to grade your produce this year, and how many grades do you intend to adopt? Which varieties of these early fruits seem to you to pack and carry most satisfactorily?
>
> Is it your practice to harrow the young maize crop? What do you reckon such an operation costs, and would it save you anything in cultivations at a later stage when the weeds are not so easily killed? Have you seen any other advantage in the practice, such as increased vigour in the crop, and what do you consider are the reasons therefor?

Cardiff.

At a meeting of the members of the above branch, which was held in September, a paper was read by Mr. W. H. Stokes, from which the following is taken:—

INCUBATION.

The best place for an incubator is in a room or cellar which has an even temperature, quietness, and freedom from vibration. Many of the houses used for the purpose vary so much in temperature, say, from 50 degrees to 100 degrees in the spring, that it is impossible for any incubator to hatch well. It will be readily understood that sudden rises in the temperature cannot have anything but a detrimental effect on the hatching. When one enters the room in the morning, it should not smell of the fumes from the lamps, as it will be apt to do where several incubators are working if the oil is bad or the wicks are not well trimmed. If the conditions necessary for proper incubation are not provided, only the strongest chicks will hatch, and if the remaining eggs are examined it will be found that a large proportion of the matured chicks which have failed to hatch have deformed feet or beaks. After starting an incubator it is not advisable to add fresh eggs at intervals. It is better to defer the start for awhile, and then keep the next lot of eggs for another week.

There are two types of incubators on the market, viz., the hot water and the hot air. If one should ask which is the best, it would be a very difficult question to answer, as both machines answer the purpose admirably. As far as I am concerned, I favour the hot water. When about to start the machine, see that the floor is firm, as a vibrating floor is to some extent injurious. For convenience it is advisable to have the incubator about 2 feet from the floor; see that it is perfectly level, adjusting it with a spirit-level. Select eggs of as equal size as it is possible to get, rejecting any too large or too small, and any with rough surfaces or badly shaped. When the eggs are put in it is best to mark them with the date. They should not be turned for at least thirty-six hours to allow the heat to penetrate to the germ; after that they must be turned twice a day up to the nineteenth day, and then allowed to remain in the incubator until hatched. The reason for the turning is to prevent the germ from adhering to the skin of the egg. The germ always floats to the top of the egg, and either allowing it to remain in the one position too long or turning it exactly to the same spot may have injurious effects. The first week seems to be the most delicate of the hatching, and I always think it advisable to run the incubator at 102 degrees for that period, advancing to 103 degrees in the second and third weeks. It is necessary during incubation to cool the eggs, at first for about the time it takes to turn the eggs, and increasing to twenty minutes in the last week, and more in the hot weather. If on putting eggs back in the incubator it is found it takes more than an hour to come back to the required temperature, the cooling has been too much, and it must be lessened, as it will be injurious. About the seventh day it is better to test out the infertile eggs, for they have a bad effect on other eggs if left in the incubator. Test again on the fourteenth day to be sure that no others have died on the journey. If every care has been taken, the hatch should be finished on the twenty-first day.

Cattai.

A meeting of this branch was held on 10th September, when a general discussion took place on the methods adopted by individual farmers and orchardists to combat the various pests of crops. White wax scale was also discussed. It was agreed that if this pest spreads widely and rapidly it will need special attention, as in the orchards it will be found that the "blackthorns" and trees are covered with this wax scale. In addition to this, members also talked over the matter of forming a scale of points for the Bureau exhibits.

A trial of grain sorghums and Sudan grass was last season conducted in connection with this branch of the Bureau, the seed being supplied by the Department, and the trial conducted on the land of Mr. J. A. Thomson, at "Bungool." Three varieties of grain sorghum (Kaoliang, Standard Milo, and Feterita) were sown alongside a plot of Sudan grass and a single row of Planter's Friend (local seed). Two sowings were made, one on 12th October and the other on 20th December. The grain sorghums (as might be expected on the coast) did not give such heavy yields of green fodder as the Sudan grass and Planter's Friend, but the seed heads were heavy with grain, and proved of great value for pigs and poultry. The trials also proved the utility and palatability of Sudan grass, of which four cuttings were made, each averaging about 3½ feet high.

DEPARTMENTAL NOTE.—The Agrostologist remarks that the grain sorghums will probably never compete with the sweet sorghums on the coast for fodder yields, and how far they can be profitably grown for their grain for poultry has yet to be proved, though their utility for that purpose is undoubted. The heavy summer rains last year rather spoilt the experiment.

Coradgery.

A party of twenty-seven members of this branch travelled by motor to Trangie Experiment Farm during August, and spent a valuable day inspecting the Farm and gleaning information from the Manager (Mr. A. H. E. McDonald) and from the Sheep and Wool Expert (Mr. J. W. Mathews), who was at the Farm at the time. The time proved instructive and profitable, and the vote of thanks that was accorded the Department's officers before the return journey commenced was a very hearty one.

Garra-Pinecliff.

A meeting of the above branch was held on 19th September, and there was a fair attendance.

After dealing with formal business, Mr. S. Robards read a short paper on the breeding of draught horses, and Mr. A. S. Blackwood delivered an address on grasshopper swarms and different methods of destroying them. Members were of opinion that the grasshoppers would not affect the Garra-Pinecliff district during the coming summer.

Lidcombe.

A meeting of members of the above branch was held on 23rd September, there being twenty members present.

Mr. Mayhall, one of the members, read an interesting paper on propagation. He dealt with the laying of cuttings, the best sorts to take, and the time to strike the different varieties. He also described the methods of preparing seed beds, the planting of seeds, and the watering of young plants.

Many useful hints were given by Mr. Mayhall, and the evening proved very interesting to the members.

Miller's Forest.

The annual meeting of this branch was held on 12th September. An interesting account of the work carried on at the local farmers' experiment plot was given by Mr. John Perrett, on whose farm the plot was conducted during the past year. He stated that different varieties of potatoes would be planted this season, and he furnished the members with particulars regarding the various manures to be used.

A paper on potato culture is to be read at the next meeting by Mr. A. J. O'Brien.

Orchard Hills.

The annual meeting was held on 23rd September, when the following office-bearers were elected :—Chairman, Mr. E. Basedow; Vice-Chairmen, Messrs. J. Dickson and R. Rankin; Treasurer, Mr. E. Basedow; Hon. Secretary, Mr. K. Basedow.

Application is to be made for permission to stage an exhibit at Challis House in February next.

Penrose-Kareela.

The monthly meeting was held at Mr. Bennett's residence at Kareela, where Mr. H. A. Mills gave a short résumé of the proceedings of the Fruit Conference recently held at Bathurst.

Spencer.

A meeting of the above branch was held on 14th September, nine members being present.

A paper entitled "Agriculture—the Staple Industry," was read by Mr. L. Woodbury, and a general discussion followed.

Stratford.

A branch of the Agricultural Bureau was formed at Stratford on 23rd August last.

The following office-bearers were elected :—Chairman, Mr. T. Germon; Vice-Chairman, Mr. A. E. Gresham; Treasurer, Mr. H. T. Perrin; Hon. Secretary, Mr. P. H. Deards.

The membership fee has been fixed at 5s. per annum.

Thyra-Bunaloo.

The annual meeting of the above branch was held on 14th September, there being an attendance of thirteen members. The existing office-bearers were re-elected.

A paper on noxious weeds was read by Mr. C. H. Smith, and from it are taken the following paragraphs :—

Some Observations on Weeds.

There are a great many definitions of weeds. One is, "Any useless or troublesome plant." A weed may be a plant which, under different circumstances, is a useful one. Useful plants which have become scattered amongst a crop cannot be separately harvested; they thus become useless, and even worse, for they vitiate the main crop. They are therefore weeds.

Immediately a plant gets out of control in cultivated or pasture land it becomes a weed. Many are vegetable pariahs; they have had a bad time, and hence have developed characters which enable them to resist annihilation. Some are especially injurious, and tenacity of life and noxiousness may be combined in the same weed. How important it is, therefore, that we should know our weeds.

An important thing to be kept in mind is that when a new weed appears on the property its identity should be ascertained, and particulars sought concerning it. To be on the safe side it should be destroyed at once, as if it seeds it may get beyond control.

Keep your property well inspected and destroy every suspected weed.

Bad points of weeds.—(1) They take up space that should be occupied by useful plants; (2) they screen off light, air, and deprive the crop of various manurial constituents; (3) they are harvested with crops, which they depreciate; (4) in many cases their seeds adhere to wool and depreciate its value.

How seeds are distributed.—(1) Many weed seeds are like dust, others have downy hairs, being scattered by the wind; (2) many adhere to stock; (3) birds are great seed carriers, especially of aquatic weeds.

Prevention.—(1) Weed seeds should be carefully excluded when packing goods; (2) weeds should be prevented from seeding; this is the surest way of all—"one year's seeding makes seven years' weeding"; (3) in buying farm seeds, avoid cheap seed; there is no economy in buying seed which can be sold cheap simply because it has been carelessly collected from paddocks infested with weeds; such seed is dear in the long run. Prevention is better than cure, and the time will surely come when all seeds will by law have to be screened. Many a bad weed is introduced in garden and vegetable seeds obtained from second-rate dealers.

Places that harbour weeds.—Neglected farms, reserves, unoccupied allotments and roads harbour many weeds. Roads are the greatest weed harbours, being the land over which animals of all descriptions pass. Municipal and shire officials are getting much more alive to this fact, but those who occupy land adjoining roads should see to it that weeds are destroyed on the roads. An invasion of a property by a destructive weed reduces the carrying capacity and productivity of the land, and eventually involves a heavy outlay in getting rid of them. It is surely not too much to expect a landholder to keep his land up in value and productiveness. Too much of "let the other fellow do his share" is ruinous to all alike. The writer knows a place in this neighbourhood where a narrow chain road was last year made less than 6 yards wide for a chain in length by Bathurst burr. There was enough seed to seed New South Wales.

Kinds of weeds.—I will deal with four only—Bathurst burr, Stinkwort, St. John's Wort, and Patterson's Curse,—but also mention a few others that are among the leading weeds of Riverina. There is the Star thistle and Saffron thistle to be dreaded. I notice that horehound is getting more plentiful. It has already been declared noxious in some places, but I do not think it will ever get a firm footing here; the wet summers probably account for its spread. It is destructive to wool and is spread by stock, but it is easily killed when young by digging. There is one 50-acre paddock in a certain district where it completely covers the land and nothing else grows.

Bathurst burr was introduced from Valparaiso, South America, in the tail of a horse between 1830 and 1840. It was first noted at Twofold Bay, and next at Bathurst, whence the name, but there are places that deserve the name much more than Bathurst. A description is unnecessary. It is a proclaimed weed in ninety-one municipalities and ninety-nine shires in this State. It is easily our worst plant, and as a food it is utterly useless. Its hooked prickles readily attach the seed to wool, hair, clothes, &c., and its presence in wool greatly reduces the value. The actual deterioration in wool and the cost of labour in eradicating it have cost the State enormous sums already. It should be prevented from maturing seed, and should be cut with a hoe or mattock in spring or summer, and, if possible, burnt. The plant is gradually spreading, and to allow it to go on unchecked is an unpardonable sin, and those in charge of roads can do great good by insisting on them being kept free.

Stinkwort (evil smelling) is a many branched, hairy, sticky, small shrub, which makes most growth in summer. The lower leaves are oblong and partly serrated; the upper are smooth edged. It has a sticky feel and a nasty smell. It first came from countries round the Mediterranean Sea, whence it spread to warm countries. It was first noted in New South Wales near Albury in 1890, having come from South Australia. Authorities differ about the harmfulness of this weed to stock, but its feeding qualities are not very high. Stock will eat it when young; but if cows get at it, the butter is nearly unsaleable on account of a bad smell and a bitter flavour.

Blue weed, Patterson's curse, Blue devil, or Blue thistle (for it is known by many names) is a somewhat shrubby herb, with large, stout, hairy leaves; flowers, dark blue or purple; stem, 1 to 3 feet, erect and many branched. It is in no way injurious to stock, in fact they like it, and in the early spring it is a valuable fodder plant, but that is the only time when stock will eat it. When full grown the stalk is rough, hairy and tough, and when it seeds and dies off, the grass is found to be killed underneath, nothing being left on the ground at all. In fact the ground looks burnt. It is a smothering, coarse plant, and the name, "curse," shows what people think of it. It should be cut with a hoe before seeding. Being an ornamental plant in flower it is often spared by people who are not aware of its danger. Both sheep and cattle eat it when young, and it can be fed off, but this must be done repeatedly. The worst of the weed is that it chokes all other plants.

St. John's wort, St. John's blood, Witch's herb or Devil's flight, grows 1 to 3 feet high, with a woody root that is hard to exterminate. The plant is easily recognised by dots or oil glands on the leaves, which, when held up to the light, have the appearance of being perforated. The flower is bright yellow, and the fruit a dry capsule with many small seeds. It was introduced as an ornamental plant, and no doubt its prettiness has had much to do with its spread. The best way to get rid of it is to pull it up before it seeds. If this is done when it is in flower, no shoots come from any roots that may be left. It is a very free seeder.

Tingha.

The annual meeting was held on 5th October, when fourteen members were present. The election of officers for the ensuing year resulted as follows:—Chairman, Mr. John Hawkins; Vice-Chairmen, Messrs. G. W. Bowning and A. J. McIlveen; Treasurer, Mr. J. L. Deasey; Hon. Secretary, Mr. M. C. Levitt. A resolution was passed thanking the Department for its sympathy and help.

The ordinary monthly meeting was then held. It was decided to co-operate in connection with staging a joint exhibit at the Inverell Show in all sections with the exception of grain, and sub-committees were appointed accordingly.

Mr. McIlveen brought up the question of a disease affecting spinach or silver beet. The subject had been referred to the Department, and the reply had been to the effect that the disease was caused by a leaf miner which was a serious pest in the United States, and that all infested plants should be carefully burnt.

A pruning demonstration was given by Mr. W. le Gay Brereton, Assistant Fruit Expert, at Mr. J. T. Robilliard's orchard, on 9th August, and the following notes describe some of his methods:—

A Pruning Demonstration.

Commencing with a young peach tree, Mr. Brereton explained that the first essential was to secure a good framework, well and evenly spaced, so that it would carry a good quantity of fruit-bearing wood. He believed in forming the head low by starting the main limbs about 15 inches from the ground; three or four shoots should be left to form the main limbs, and these should be nicely spaced to produce a well-balanced tree. In the young stages it was best to top heavily to secure sufficient increase in the number of leaders, two or more generally starting from each topped one. Sufficient of these should be retained to form the framework of the tree, with the limbs growing outwards and upwards. Where more strong leaders than necessary had started from a topped shoot sufficient should be left to give the required spread and shape, and the others should be taken out, otherwise the tree would be too thick, badly shaped and unable to carry a heavy load of fruit. It was a mistake to have a tree too spreading, as it increased the difficulty of cultivation. After the establishment of the lower framework, when a tree was growing vigorously, it was best to leave the main leaders untopped; it would be found that replacing laterals would take place more readily than if heavily topped. Some trees naturally had a rather spreading habit, and in these cases the opposing limbs might be tied together to bring them into a more upright position. An important point with peach trees was that it would generally be found best to cut to an under eye, as, if the cut was made to an upper eye, it would often happen that an under eye would come away strongly and rob the upper one of sap, so that it failed to grow and at the next pruning had to be cut away. The shoot from under the eye meanwhile had grown in a more spreading direction, owing to the shoot from the other eye being in the way, so that the new growth was more spreading than was desirable.

When topping heavily it would be found that two strong shoots would come away from the first and second eyes, and these were too close together to give the necessary space, so by rubbing or "brushing" off some of the eyes in the early spring, better spacing might be obtained. The peach crops on wood made during the previous season, and an examination of yearling wood would show round-headed plump buds, which would develop into flowers and fruit, and sharper, pointed buds which come out as leaves. There were no permanent fruit spurs formed on the two-year-old wood, as in the apple and the pear; therefore the old wood required removing, in order to promote the growth of new bearing wood. In unpruned trees this was often effected by the weight of fruit bending the laterals down when a new growth often started from the buds above the bend. The head of the tree must be kept thinned out, as if it was allowed to grow too brushy, the growth was confined to the top, with the result that fruiting wood did not form lower down. The laterals or side shoots which bore the fruit should be carefully examined to note the way in which the tree cropped. It had been found that the same variety would vary in different districts, so that the orchardist must use his own powers of observation. As an example, Briggs' Red May was generally a poor setter, so that shortening the laterals meant a poor crop; but in the warm inland districts this variety might set heavily, and then the laterals require shortening back. If in doubt, it was better to leave the laterals long, and if the tree was found to set too much fruit it could be thinned out. The best quality fruit would be found on strong laterals which carried well-defined eyes.

In forming the tree, where a weak leader occurred they should take out the strong growing laterals in order to throw the strength into the leader.

Replying to questions, Mr. Brereton stated that a better new growth could mostly be obtained by leaving the extra tip, as the dormant bud seemed to be stimulated, and it could be cut out next winter. They could check a strong leader by pinching back during the growing period, to allow the weaker ones to catch up.

The next tree pruned was a young plum. As many plums had a tendency to grow straight upwards, it was advisable to cut to outward eyes to get the spread. English plums generally cropped on short spurs formed on the old wood, though some fruit was borne on yearling wood. The laterals should be given plenty of length to let them spur up; if shortened too much the tendency was to start growing again from the end. Some plums, such as Grand Duke, had a tendency to carry fruit only once on the spurs. This needed watching, so that renewal of fruiting wood might be carried out, though the plum did not require an annual renewal of fruit-bearing wood, like the peach. Exhausted spurs should be cut hard back to start new spurs from the dormant buds. Japanese plums spurred very readily, and the laterals could be well shortened back.

When young the cherry-tree should be well topped to get the formation of limbs, but this should be discontinued at the earliest possible moment, as the cherry was very liable to gum. It also required to be kept free from San José scale, which was a frequent cause of gumming. After the tree had been formed, it should receive very little pruning.

The lecturer then proceeded to prune an apple tree which had not received correct treatment the previous winter. In most apples the yearling wood should be given plenty of length, the tendency induced by too much shortening being to develop wood instead of spurs. When shortening leaders, they should avoid, if possible, cutting back to a spur, but a lateral might be shortened back to a spur.

A good hint given was to wipe the secateurs with an oiled rag, which had been dipped in kerosene, to prevent infection being carried from a scale-infected tree to a clean one.

In apricots the spurs were short lived, and require thinning out.

A Wickson plum which was growing very upright afforded Mr. Brereton an opportunity of demonstrating a method of forcing growth outwards by using spreaders, until such time as heavy bearing tended to hold the tree in such a position. Two styles of spreaders were used, one being V shaped at both ends, the other forked at one end and wedge shaped at the other so that it held firmly. He emphasised the importance of cutting to an outward eye, and in some instances favoured retaining an eye above the one wanted, in order to force the growth more outwards. Next winter the growth that was not wanted could be taken out.

In reply to questions, a number of suggestions were made for the control of diseases. Acknowledging a vote of thanks, Mr. Brereton stated that though he believed carefully selected parts of the district were well suited to the production of fine quality fruit, yet he wished to utter the warning that, until better transport facilities were available, it would be decidedly unwise to go in heavily for fruit-growing.

Toronto.

A meeting of the above branch was held on 3rd September, there being a fair attendance.

After dealing with formal business, the evening was devoted to general discussion of the following matters:—The qualities of Jersey and Shorthorn dairy cattle, fungus and insect pests and suitable sprays for same, and varieties of fruit suitable for the Toronto district.

Warner's Bay and District.

Mr. C. W. Burrows, Field Assistant, visited this branch on 2nd September, and conducted a demonstration of subsoiling and clearing with explosives at Mr. J. Raws' property.

Subsoiling and Clearing with Explosives.

The soil was of volcanic formation mixed with fine gravel, and therefore not very suitable for subsoiling treatment with explosives; moreover, constant rains had made the soil less retentive than in dry weather. However, a charge of one plug of gelignite was put 2 feet deep, Mr. Burrows explaining the method of putting the fuse in the cap, crimping it and placing it in position. The effect of the explosion was to break up the ground nicely for about 3 feet all round, giving a good idea of what could be accomplished in suitable soil.

An old Lisbon lemon tree was next selected, a hole bored a few feet away at an angle that allowed the charge to be placed, as near as could be judged, under the centre of the tree. Half a plug of gelignite was used, and the explosion lifted the tree slightly, after which it eased back into its former position. The ground for a few feet round was thoroughly broken up and apparently no harm was done to the tree.

Two stumps were next selected for attention, and were successfully broken up, so that they could be burned with ease.

Emphasis was laid during the demonstration on the proper way of handling the charges, especially with regard to tamping a shot at the first; the work should be very gently done for a few inches, and then as it was considered safe the tamping could be firmer.

Windsor.

A meeting of this branch was held on 23rd September, when Mr. James Hadlington, Poultry Expert, delivered a valuable lecture.

Table Poultry.

Mr. Hadlington pointed out that poultry farmers were not making the most of their resources when they failed to rear their cockerels to the age and weight when they would be fair table poultry. Our markets were not well supplied with anything like the number of prime birds they could absorb at prices remunerative to the farmer. The average poultry farmer had it so firmly fixed in his mind that it would not pay to rear cockerels that he failed even to put it to the test. Speaking of the Windsor district, he said he had seen very fine specimens of table poultry, principally game crosses, at their local show; but he was sorry to say that judges, in making their awards, often failed to recognise prime table poultry, and simply awarded the prize to the heaviest birds. Weight alone did not constitute prime quality. The different classes that constituted good and inferior birds were shown by means of slides on the screen. They should not despise even the White Leghorn, for it would pay to rear the cockerels of that breed to the right age and weight. As proof of this he mentioned that at Hawkesbury Agricultural College White Leghorn cockerels, marketed at between five and six months old, were making 5s. 6d. to 6s. 11d. per pair last season, while heavier breeds made up to 10s. 2d. per pair. These birds were not fattened, but were simply caught up out of the rearing enclosure, and marketed without any special preparation, and under the same conditions as were open to everyone in the district, or even in the county of Cumberland.

The method of rearing chickens in large and small numbers was illustrated by slides, and explained. The methods that would ensure success in egg production would also produce good payable table poultry, because nothing short of good stock and good development in rearing the young would lead to profitable operations. To this end they must have a good class of bird on their farms. A mere reputation for productiveness would not ensure this. They must have birds of good physique, and of the character of the breed. Types of the class of bird to breed from were shown, together with undesirable types.

Replying to questions, Mr. Hadlington said he did not believe in late hatching; on that he was very emphatic. Heavy breeds should be hatched out, if possible, during the months of July and August, preferably by the middle of August, particularly if required for breeding stock, and light breeds by the end of September, preferably sooner. He went on to say that late hatching led up to degeneracy and to constitutional weakness.

The Hogan test was not a sufficient test in itself by which to select birds for the breeding pens, but if taken in conjunction with desirable characters it might perhaps lead to a better selection being made.

For combined qualities of egg production and table poultry he would recommend such breeds as Black Orpington, Buff Orpington, Langshan, and Rhode Island Red; even White Leghorns were not to be despised as table poultry, if well grown. He pointed out, too, that because a fowl was black it did not follow that it was an Orpington. He referred only to the desirable type of Black Orpington, and not to a mere black fowl, irrespective of size.

Woonona.

The annual meeting of members of the above branch was held on 10th September, a very good number of members attending. The annual report disclosed a satisfactory condition of affairs. The year finished with a membership of 102. The financial statement was also considered gratifying, there being a credit balance of £26 13s. 8d.

The election of office-bearers for the ensuing year took place, with the following results:—Chairman, Mr. E. Cameron; Vice-Chairman, Mr. E. Perkins; Treasurer, Mr. G. Fowler; Hon. Secretary, Mr. H. Coltman; Assistant Secretary, Mr. A. Cavill.

Each member was urged to make a special effort to secure at least one new member for the next meeting, and arrangements are being made to educate the members upon the standard of judging, so as to gain members and make the meetings more interesting. It was also suggested that a sectional Flower Show Competition might be held.

Yarramalong.

A meeting was held on 14th September, when a discussion took place regarding a proposal that the branch should pay a bonus of 5s. per head on all foxes killed in the district, skins to be produced and bonus paid subject to *bona fides* being established.

Mr. E. Hodges placed before the members the results of maize experiments carried out by him in conjunction with the Department of Agriculture; the yields were not as satisfactory as they might have been, owing to excessive rains. The members were invited to view the plots.

A discussion also took place regarding the advisability of co-operation by members with a view to obtaining orchard materials co-operatively in large quantities, so as to reduce expenses. The Secretary explained that the objects of the Bureau were to establish a closer relationship between farmers.

Yurrunga and Avoca.

On 17th August a demonstration was held in connection with the destruction of rabbits by fumigation on the farm of Mr. Wright, Avoca. Carbon and smoke mixture were the ingredients used, and two large warrens were tried. The experiment proved successful, for one of the warrens was opened up and the rabbits were found quite dead—the lungs of those opened being almost black.

On 21st September the usual monthly meeting was held. Mr. E. Gim was elected Organising Secretary, and a committee was appointed to arrange exhibits for the branch at the forthcoming show.

COMMERCIAL PROSPECTS OF HERB PRODUCTION.

IN view of the attention at present given to the possibilities of the production of herbs and medicinal plants, owing to supplies being unobtainable from enemy countries, the following conclusions arrived at by G. N. Keller in an article in the *Journal of the Department of Agriculture and Technical Instruction for Ireland* will be found to be of interest, and may apply equally well to Australian conditions:—

> According to all available evidence the collection of wild medicinal plants in Ireland would not be profitable when prices are normal. The cultivation of certain drug plants should, in view of their present scarcity and high prices, be very profitable to persons who have the necessary knowledge and facilities for the purpose. Under normal conditions the commercial production of medicinal plants does not present unusual opportunities for quick returns and huge profits. The market demand for crude drugs is so small as to render their general cultivation somewhat hazardous. The produce of a comparatively few acres of most varieties of herbs would overstock the market, and likewise a bountiful crop year would have a very depressing effect on prices. In order to reduce their risks in this respect it is the practice of experienced growers whose products have a good reputation to enter into contracts in advance for the supply of definite quantities of particular plants.
>
> Information regarding the cultivation and drying of medicinal plants is not so complete and accessible as in the case of ordinary crops. The production of drugs of high quality requires, however, skilled management and special knowledge. Some writers have gone so far as to say that a chemical knowledge of the drugs, and facilities for making standard extracts from the fresh undried plants, are essential to success. No doubt a person or company thus equipped has a great advantage over competitors. In general, the cultivation of medicinal herbs would be more likely to succeed as a special industry in the hands of well-equipped growers than as a side issue to general farming.

Orchard Notes.

NOVEMBER.

W. J. ALLEN.

OCTOBER proved a trying time for many growers owing to the severe frosts experienced during the earlier portion of the month, the severity of which and the damage caused in some localities, were largely due to the very dry atmospheric conditions. These conditions, while very helpful in preventing to a large extent the development of Fusicladium of the apple and pear, and Anthracnose of the vine, caused a considerable amount of damage to the fruit in some localities.

Cultivation.

Generally the ploughing was carried out in good time, and those growers who gave full attention to this very necessary spring work, and to the subsequent cultivation, will reap the full benefit, because the well cultivated soil will enable the moisture retained in the subsoil to carry the trees, if necessary, through a prolonged dry spell.

It is unwise to allow the trees to be insufficiently supplied with moisture when the fruit is setting and developing.

The cultivator must be kept going, stirring the soil frequently and deeply, and when rain does come the soil crust must be broken immediately, otherwise the moisture will be quickly evaporated from the soil during the hot weather, more especially if hot winds prevail.

Spraying.

Black Spot.—This very necessary work must not be neglected. The majority of the growers have wisely taken no risks of the depreciation of their fruit crops, and the spray pump has been more in evidence in the orchards than usual. Large numbers of growers have used lime-sulphur or Bordeaux mixture at the "pinking stage" of the apples and pears for Black Spot, and have followed this with a second application at the "petal dropping" stage, together with an application of arsenate of lead for Codlin Moth.

Apple Mildew.—The season so far has been favourable to the development of Mildew, and the use of iron sulphide or atomic sulphur on those varieties of apples affected, has been an additional safeguard.

Codlin Moth.—At least one spraying this month with arsenate of lead will be necessary for Codlin Moth, and the bandages must now be placed round the trunks of the trees and regularly examined for the caterpillars. All fallen fruit should be immediately picked up, and the infested fruit destroyed.

Vine Diseases.—The vines, in most instances, were well treated for Black Spot, just as the buds swelled, followed by Bordeaux mixture when the growth started. This should be followed by an application after the fruit sets, using the 6-4-50 formula. In moist or wet situations where Anthracnose was bad last season an application was necessary between the two stages—just before the flowers opened.

The vines must still be dusted regularly with sulphur to safeguard them against oïdium.

Leaf-eating Pests.—A close watch should be kept for Pear and Cherry Slugs and Vine Caterpillars, and immediately they are in evidence the trees and vines should be sprayed with arsenate of lead.

Fruit Fly.

Fruit Fly may prove troublesome in the early summer fruits, and every effort should be made to destroy the early broods by picking up all fallen fruit and destroying, by boiling for twenty minutes, all infested fruit. Traps and baits should also be freely used.

Peach Tip Moth.

Growers are urged to use all means possible to destroy the first brood of Peach Tip Moth, whose maggot infests the tips of the young shoots. If these tips are nipped off a couple of inches below where they show signs of drooping and are burned, large numbers of the first brood will be destroyed, and as each female moth probably lays one hundred eggs, this method will considerably reduce the second brood, which infests the fruit.

Young Trees.

Give every care and attention to the newly planted and young trees ; keep the surface of the soil round them in free condition with the cultivator, and where the cultivator does not reach loosen with the hoe. Water any newly planted tree that shows signs of flagging.

Summer Thinning.

Go over all young trees, removing crowded or unnecessary growths so as to direct the full vigour of the tree into the permanent channels necessary to form a strong well-built framework. Allow free circulation of light and air, and develop fruiting wood by shortening in lateral growths necessary for this purpose.

All grape vines should be gone over, disbudding and rubbing off superfluous growths, more especially those coming directly off the old arms and trunk.

Thinning Fruit.

The final dropping of young fruit will now have taken place, and on all varieties where the fruit has set too heavily it should be thinned out. It does not pay at the present high cost of labour, and at the price of coverings to market any but good quality fruit.

Harvesting.

The early cherries will shortly be ready for marketing, followed by the early peaches and apricots in coastal districts. Growers will find it pays to grade and pack the fruit carefully. Face all first quality boxes of cherries, but see that the fruit underneath is of the same quality as the faced layer.

Make every provision for handling and marketing the mid-season fruits, for if the season proves hot and dry they will mature rapidly. A careful estimate should be made of the crop, so as to have the necessary cases, &c., on hand.

Buds and Grafts.

All buds and grafts should be carefully gone over, all shoots other than those from the scion or bud being removed. When the required shoots are 18 inches high they should be nipped back ; this strengthens and causes them to branch.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

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1918.		
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1919.		
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Gosford and Brisbane Water A. and H. Association	W. Moore	,, 24, 25
Kiama Agricultural Society	G. A. Somerville	,, 25, 27
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Yanco Irrigation Area A. Society (Leeton)	T. H. Hogan	,, 25, 26
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Inverell P. and A. Association	J. T. Dale	,, 25, 26, 27
Dorrigo and Guy Fawkes A. Association	R. R. Blair	,, 26, 27
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Newcastle A., H., and I. Association	E. J. Dann	,, 26, 27, 28; March 1
Bathurst A., H., and P. Association	S. V. Turrell	Mar. 4, 5, 6
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Cobargo A., P., and H. Society	T. F. Kennelly	,, 19, 20
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Camden A., H., and I. Society	A. E. Baldock	April 2, 3, 4
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Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 9, 10
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 15–23
Moree P. and A. Society	A. U. Ezzy	May 21, 22, 23
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	Aug. 26, 27, 28
Ganmain A. and P. Association	T. S. Henderson	Sept. 9, 10
Temora P., A., H., and I. Association	A. W. Ness	,, 16, 17, 18

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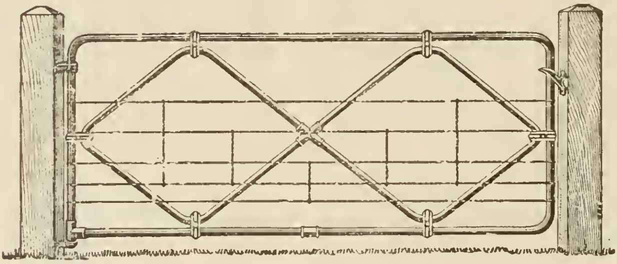

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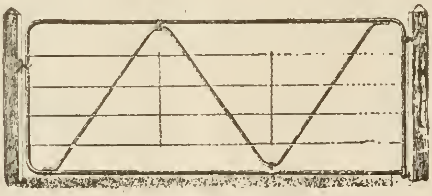

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2nd December, 1918.

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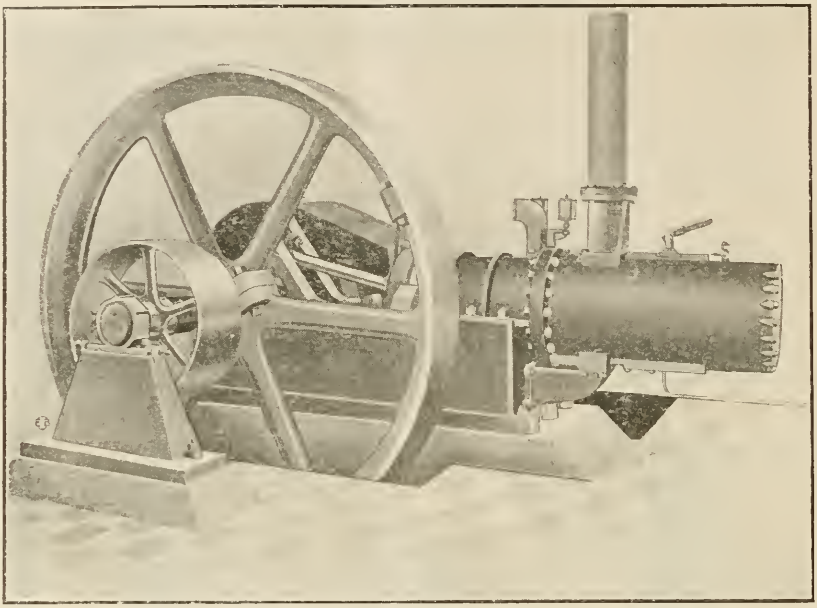

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Agricultural Gazette of New South Wales.

Popular Descriptions of Grasses.

[Continued from page 785.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE PANIC GRASSES.

THE genus *Panicum* constitutes one of the largest genera of the grasses. It numbers 300 species, distributed all over the world. Generally speaking, however, they are mostly confined to the tropical, sub-tropical, and hot temperate regions, and the few that are found in Europe are confined to the warm parts of Italy. The United States of America and Australia are particularly well represented, and there are sixty species native to this country.

The *Panicum* species, or Panic grasses as they are often called, are true sun grasses, and also require generally a fair amount of moisture to reach ordinary development. Under such conditions they make rapid growth, and in a short time produce an abundant supply of seed.

As a rule, the Panic grasses are easily distinguished by the structure and appearance of the inflorescence or seed head. Each seed is singly represented in its individual bracts, and very often, owing to the plumpness of the seeds, the flowering or seed spikelets stand out prominently on the flowering stalks. Amongst the Australian grasses, some of the Paspalums and the Eriochloas closely resemble the Panic grasses, but the presence of a small outer bract in the spikelets of the Panicums generally makes the distinction clear.

Most of the Panic grasses have a tussocky habit, but a few are creeping. All the Panic grasses of the interior are of a tufted character, and these tufts, under judicious stocking, will often attain a considerable size, averaging from 1 to 2 feet in diameter.

Some of the Panic grasses will not thrive except under constantly moist conditions. Others, however, have a root and leaf system admirably adapted for tiding them over dry periods. One Panic grass (a form of *P. divaricatissimum,* commonly known as Spider grass or Umbrella grass) has such a thick coating of hairs on the leaves that it is only slightly affected by very extreme conditions. Again, this grass, together with many others, has a decided swelling at the base of the stems, which is caused by the overlapping of numerous hairy sheath leaves. The denseness of the hairs on these sheathing leaves probably acts as a screen, preventing the rapid removal of the air between the outside of the sheathing leaves and the stem. Thus transpiration of moisture is checked to a considerable extent, and the root-stock is protected in consequence.

The following Panic grasses have moist habitats or surroundings in Australia :—*P. indicum, P. crus-galli* (Swamp or Barnyard grass), *P. repens,* and

P. obseptum. The distribution of the Panic grasses is well shown in the appended list. For the sake of convenience, New South Wales has been divided into four climatic areas, viz.—(1) a summer rainfall zone (which constitutes the area north of a line passing through Bourke, Coonamble, and Quirindi); (2) a winter rainfall zone (constituting the area south of a line passing through Wilcannia, Condobolin, and Yass); (3) a neutral rainfall zone (which lies between the previous two, and receives a regular distribution of rain practically throughout the year); and (4) a coastal rainfall zone. It will be observed from the accompanying table that, excluding the coast, the summer rainfall zone easily leads in the number of the Panic grasses, strikingly illustrating their adaptability to hot moist conditions. The coast is also sufficiently supplied with heat and moisture during the summer months to allow the Panic grasses to attain their maximum development.

Name.	Summer Rainfall Zone.	Winter Rainfall Zone.	Neutral Rainfall Zone.	Coast.
P. cœnicolum	...	*	...	...
P. parviflorum	*	...	...	*
P. tenuissimum	*	...	...	*
P. sanguinale	*	*	*	*
P. semialatum	*	...	...	*
P. leucophæum	*	*	*	...
P. queenslandicum	*	*	...	*
P. Benthami	*	...	...	*
P. proliferum	*	*	...	...
P. cruspavonis	*	*	*	*
P. crus-galli	*	*	*	*
P. flavidum	*	...	*	...
P. Gilesii	*	...	...	...
P. polyphyllum	...	...	...	*
P. distachyum	*	...	*	...
P. reversum	...	...	*	...
P. indicum	...	...	...	*
P. adspersum	*	...	...	...
P. uncinulatum	*	...	...	*
P. pygmæum	...	...	...	*
P. repens	*	...	...	...
P. marginatum	...	...	...	*
P. obseptum	...	...	...	*
P. prolutum	*	...	...	...
P. strictum	...	...	...	*
P. effusum	*	*	*	*
P. bicolor	...	...	...	*
P. melananthum	*	...	...	*
P. decompositum	*	...	...	...
Totals	20	8	8	18

Many of the Panic grasses native to Australia are also found in other countries. Amongst these may be mentioned *P. sanguinale* (Summer grass), *P. antidotale*, and *P. flavidum* (Warrego Summer grass) in India and Africa; *P. colonum* (Swamp or Barnyard grass) in the old and the new worlds; *P. myurus* in Africa; *P. indicum* in Asia and Africa; and *P. distachyum* in India.

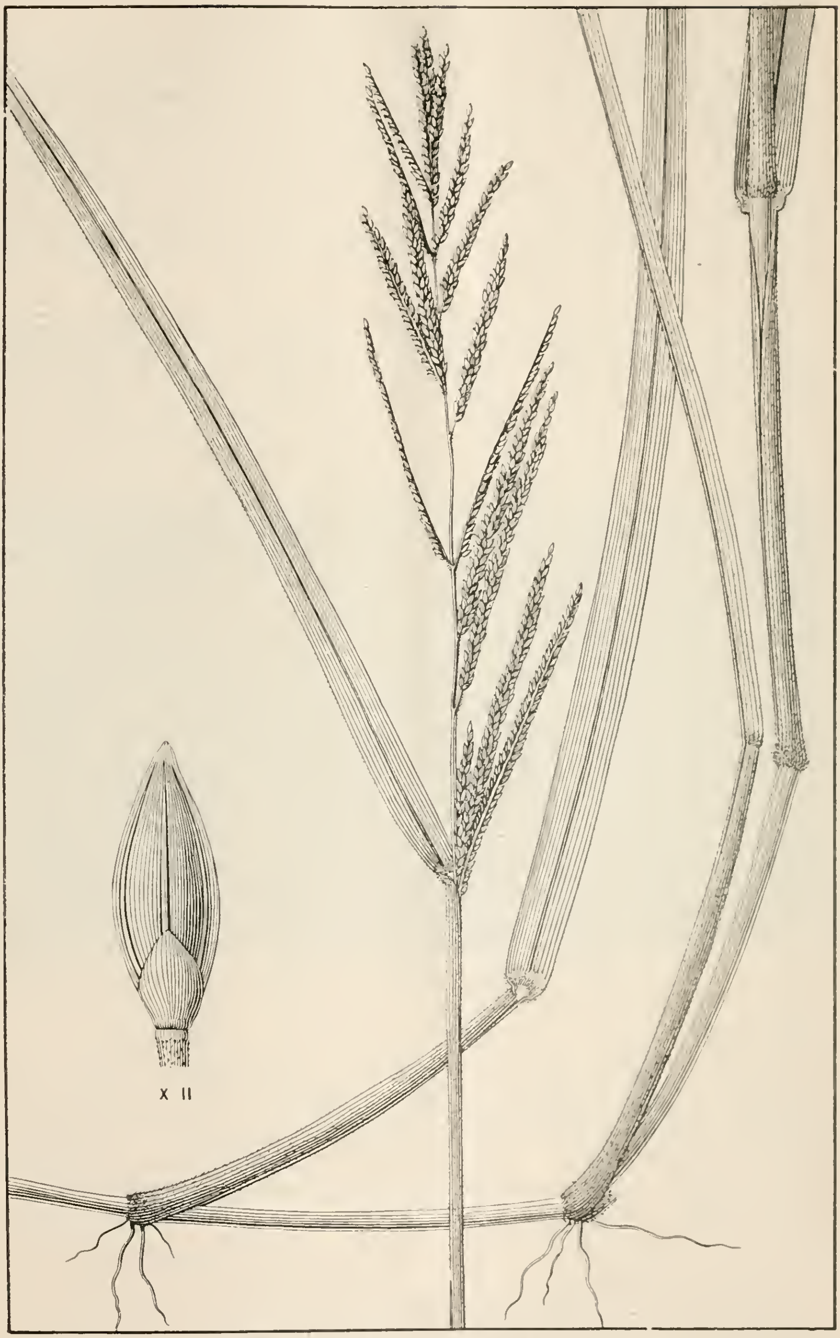


Fig. 1.—Para Grass (*Panicum muticum* Forsk.).
Note the creeping root system and the heavy stems and leaves

POPULAR DESCRIPTIONS OF GRASSES.

The Cultivated Panic Grasses.

Most of the cultivated Panic grasses are grown under the name of millets. The principal of these are *P. miliaceum*, *P. frumentaceum*, and *P. crus-galli*.

In addition, *P. muticum* (Para grass) and *P. maximum* (Guinea grass) have come into favour as cultivated pasture grasses, while experiments, with a view to bringing them under cultivation, are being carried out with certain other varieties, viz., *P. decompositum* (Native Millet), *P. flavidum* (Warrego Summer grass), *P. prolutum* (Coolah grass), amongst the natives, and *P. bulbosum* (Texas grass) amongst the introduced.

P. frumentaceum and *P. crus-galli* are generally cultivated under the name of Japanese Millet, while *P. miliaceum* is often known as Brown Corn Millet, Proso French Millet, and sometimes as Chinese Millet. These millets, together with others, will be dealt with in a later article.

PARA GRASS (*Panicum muticum*). (See Fig. 1.)

Other names for this grass are Mauritius Grass, Scotch Grass, and Water Grass. The scientific name applied to the grass in this State is *Panicum muticum* Forsk., and this is also the name by which it is known in Ceylon and the West Indies. Other scientific terms applied to the grass are—*P. barbinode* Trin., and *P. molle* Gris.

Para grass is now grown largely in Ceylon, East Indies, Philippine Islands, Fiji, Hawaii, and other South Sea Islands, West Indies, Florida, British Guiana, and other parts of South America, and in Queensland. Its valuable properties have been known since 1849, when seed received from Barbados was distributed by Sir William Hooker to the different English colonies.

Para grass is rather coarse and vigorous, but with succulent stems and leaves. It is characterised by having very hairy nodes on the stems, and by rooting readily at the joints. If given free scope, the rapidity with which these stoloniferous stems grow along the ground and root at every node is surprising. From the rooted nodes straight shoots spring up, growing (in Queensland and on the Northern Rivers) to a height of 2 to 3 feet. So thickly are the running stems and vertical shoots produced, that a plot containing the fully developed grass presents such a thick, tangled mass that it is almost impossible to walk through it.

Para grass is highly spoken of in semi-tropical and tropical countries. It forms one of the principal cattle grasses in Fiji and Hawaii. In the latter country it is grown under heavy rainfall or irrigation as a green soiling crop for horses and dairy cattle. It is also used to some extent as a pasture grass. The best results have been reported from low, wet lands, and it is credited with completely drying out semi-marshy lands. Under a heavy rainfall it yielded at the rate of 31 tons per acre of green forage in four cuttings within nine months of planting.

At Singalong and Alabang in the Philippine Islands it was described as producing runners 3 to 6 yards long. The hay was difficult to cure, but very palatable in quality.

In Ceylon the grass was cut twice at an interval of eighty-seven days, and yielded for the two cuttings a total of 12 tons of green fodder per acre.

The highest yield recorded from this grass appears to be from an old-established plot in British Guiana, which gave in five mowings during the year a yield of 41½ tons of green fodder per acre.

Para grass is grown to some extent in Queensland, particularly along the coastal districts. There are only one or two references to it in the *Queensland Agricultural Journal,* but it is credited with doing well at the State Agricultural College, and also at Biggenden.

A Plot of Para Grass, Wollongbar Experiment Farm.

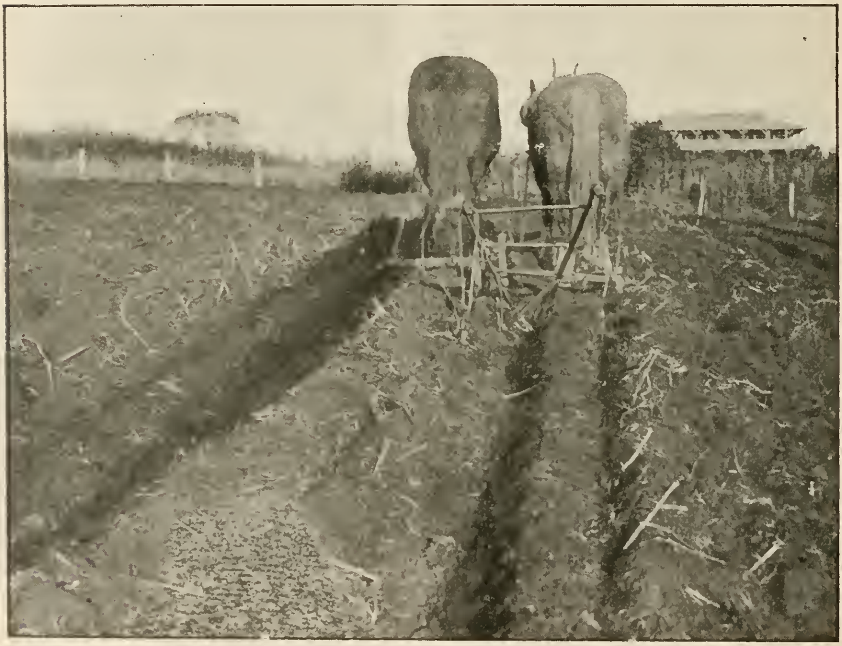
In New South Wales it has been tried at Grafton and Wollongbar Experiment Farms, at Hawkesbury Agricultural College, and at Yanco Experiment Farm. As a result of these trials it has been definitely proved—(1) that the grass does best in the hot coastal climates of the Northern Rivers; (2) that at Yanco, even under irrigation, its growth is very small compared with that at Grafton and Wollongbar. The latter result may be due to two reasons:—

(*a*) The absence of the maritime influences and a consequently dry atmosphere; or

(*b*) the hard nature of the soil which, when dry, militates against the rooting of the grass at the nodes of the runners.

At Grafton, Para grass is often cut down by frosts, but at Wollongbar it remains green practically throughout the year. It makes very rapid growth during the summer months, forming a dense mat of leaves and succulent stems, 2 to 3 feet in height. It holds its own readily with paspalum, and when once established, cannot be encroached on by that grass. Owing to this fact, and also because a change of pasture from paspalum is desirable, an experiment is at present being conducted to determine its value under grazing conditions.

Up to date this grass has been little grown by farmers. This is probably due to the popularity of paspalum, and also partly to the fact that Para grass does not mature its seed, and root planting is necessary. The latter, however, is very easily accomplished because of the readiness with which any portion of the stem with a joint strikes in the soil. A running stem of this grass will provide several off-sets, and if furrows are ploughed in one direction and the off-sets are placed at 3 or 4 feet intervals in the furrows, and covered with the soil by running the plough in the opposite direction, a considerable amount of ground can be covered in a day.



Planting a pasture of Para Grass, Wollongbar Experiment Farm.

GUINEA GRASS (*Panicum maximum*). (Fig. 2.)

Guinea grass is perhaps more largely grown in tropical and semi-tropical countries, and in Jamaica, where it is known as Zacate, it is considered second only in importance to sugar as a primary product.

As its name implies, this grass is a native of Guinea in Africa, and the *Kew Bulletin* supplies the following information :—" In Brazil this grass is known as 'Capim de Colonia.' It was accidentally introduced to Jamaica from the coast of Guinea as bird food about 1740. In 1794 Bryan Edwards wrote: 'Most of the grazing and breeding pens were originally created, and are still supported by means of this invaluable herbage, and perhaps the settlement of the north side is wholly owing to the introduction of this excellent grass. Although it usually seeds freely, it is generally propagated by root cuttings. When it grows rank and tall it should be cut frequently, to prevent it becoming too hard and coarse. Analysis shows it to be very rich in nutritive qualities, and where this grass can be fully established it is probably the best fodder plant known for permanent cultivation. It is a favourite grass for stall fodder, but it is sometimes necessary to guard against over-feeding with this grass alone in a rank state. It would form an excellent material for preserving in silos.' "

Unlike Para grass, Guinea grass is tufted, growing to a height of 3 to 6 feet. Some of the tufts when fully established measure 3 to 5 feet across. The leaves are broad and flat, and the leaf sheaths and nodes of the stem are hairy. The inflorescence is generally well developed, although the seed does not set too well, and it also sheds very irregularly.

The best results with this grass have been obtained in India, Ceylon, Fiji, Hawaii, West Indies, and South America. When planted in India it yielded in the first year 4 tons of green fodder per acre, and in the succeeding five years 28 to 100 tons per acre. In Hawaii it grows to a height of 6 to 10 feet, and is used principally as a soiling crop. If to be fed to horses without being run through a feed cutter, the crop should be cut frequently, as the grass becomes coarse at the base. It is not recommended in that country as a pasture grass, though 16 acres of Guinea and 4 acres of Para grass carried forty head of mules and horses for the year.

In British Guiana the grass gave for five cuts during the year, a total yield of 107 tons of green fodder per acre.

Frequent references have been made to the capacity of this grass for retaining its vitality for long periods. Plots twenty years old have been recorded, showing no deterioration whatever. One writer in India states: "There is no other plant, wild or cultivated, that yields such a large amount of greenstuff every year for a generation."

Guinea grass was introduced into the Philippines in 1907, and proved a great success right from the start. It is credited there with being the best perennial grass that can be cut for green feed, and its feeding value was highly spoken of. At one farm it was cut eleven times in a year, and averaged 110 tons of green feed for that period. The grass was fed to the work and saddle horses in place of hay, and an inspection of the animals showed their condition to be excellent. At the request of the American military commander, General Pershing, the military horses were fed with this grass, and it was found that 126 tons were required to feed 615 horses for a month.

Guinea grass was chemically analysed in Queensland some considerable time ago in two stages, viz., over-ripe growth and young shoots, and was reported on as follows :—

	Over-ripe Grass. per cent.	Young Shoots. per cent.
Moisture	70·92	69·08
Soluble albuminoids	·88	·86
Insoluble albuminoids	·66	2·20
Digestible fibre	1·94	2·25
Woody fibre	20·11	13·92
Soluble ash	1·07	1·02
Insoluble ash	2·29	3·55
Chlorophyl, amides, &c.	2·13	7·12
	100·00	100·00
Total nitrogen	·40	·71
Total albuminoid nitrogen	·25	·49
Albuminoid ratio	1 : 14·3	1 : 5·3

A very careful experiment was carried out at Trinidad (West Indies) to determine the food value of the grass, and the following table was published. It is very interesting to compare Guinea grass in this respect with other well-known fodder plants :—

	Moisture.	Albuminous compounds.	Carbonaceous principles and woody fibre.	Mineral matter.	Ash.
	per cent.	per cent.	per cent.	per cent.	per cent.
Guinea grass (air-dried)	18·90	7·80	58·32	14·97	......
Clover hay	11·16	7·30	72·03	9·01	4·14
Vetch	10·10	8·25	86·07	5·68	6·3
Couch grass	15·50	6·59	65·94	11·95	......
Para grass	15·50	5·24	69·97	9·28	......

It will be noticed that, although it is somewhat low in carbonaceous matter, it is very high in albuminous compounds.

Roots of this grass were distributed in 1898 from Wollongbar Experiment Farm to farmers on the Northern Rivers, who reported very favourably on it, and references were made to its drought-resistant qualities, and also to its adaptability for chaff and for ensilage. This was over twenty years ago, and yet the fact remains that the grass has not become popular to any extent, due probably to the advantages and the vigorous properties of paspalum, and to the fact that Guinea grass is not a good seeder. The plots at Grafton and Wollongbar Experiment Farms have been established for a considerable number of years, and they are now as good as when first laid down. Yields of 40 tons of green feed per acre have been obtained from the plot at Wollongbar, and the one at Grafton does nearly as well. The grass sets a fair amount of seed, but it ripens unevenly and shatters easily, consequently the harvesting of the seed necessitates several operations during the year—a very bad feature in a grass. However, root planting is easily carried out, and a pasture has just been laid down by this method at Wollongbar to determine the

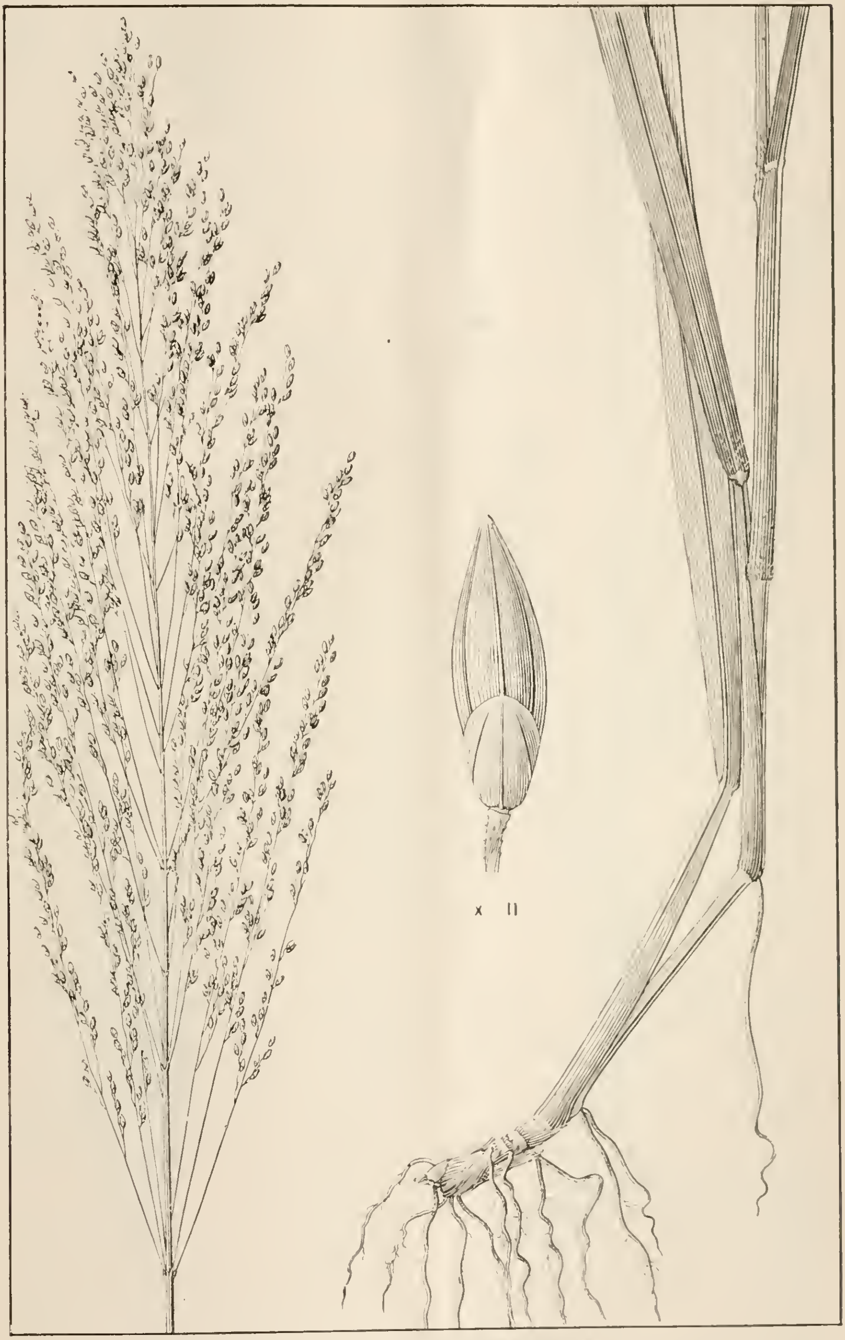


Fig. 2.—**Guinea Grass** (*Panicum maximum* Jacq.).
Note the vigorous root system of this grass, and slightly nodal rooting.

POPULAR DESCRIPTIONS OF GRASSES.

value of the grass under grazing conditions. When established Guinea grass is just as aggressive as Para grass, and cannot be encroached upon by paspalum.

Guinea grass was tried at Yanco Experiment Farm under irrigation. The clumps grew well, but did not produce anything like the yields common on the Northern Rivers.

Guinea grass is still likely to become popular on the North Coast when farmers, under closer settlement, come to realise that a change from paspalum diet is necessary for the well-being of the dairy herd. Such an old-tried and well-proved grass must eventually find a place in the balanced ration in districts where its vigorous growth is assured.

TEXAS GRASS (*Panicum bulbosum*). (Fig. 3.)

In appearance, particularly of the inflorescence, this grass somewhat resembles Guinea grass, and is considered by some botanists a variety of the latter; but the presence of the bulbous root-stock, the softer character of the leaves, and the different climatic conditions under which it thrives, renders the distinction from Guinea grass very complete.

Texas grass is a native of Mexico and Texas, U.S.A., which was introduced into this State by the Agricultural Department several years ago.

It is a perennial tufted grass, and, as its name implies, it has a bulbous root-stock. This probably acts as a water storage organ during dry periods, and, together with the deep roots, is one of the valuable features of the grass. In Texas it is known as Alkali Saccaton. In that State it is found in cultivated fields, and is considered a valuable hay grass.

It is now grown at practically every experiment farm in New South Wales, both on the coast and in the interior, and at no place does it do badly; while in the interior it is doubtful if it is not superior, under cultivation, to our best native grasses. Its drought-resistance is very characteristic, and it has been observed that, at Nyngan, during hot spells its leaves do not curl up as in many native grasses. This is probably due to the well-developed bulbosity of the root-stock, which can retain much of the moisture in place of the leaves.

Texas grass is essentially a summer grass, but it also makes good growth in the spring and autumn months. It does not come away as early in the spring as Coolah grass or Warrego summer grass, but it appears to last later in the autumn. It seeds heavily, although somewhat irregularly, but the seed does not germinate as well as that of the cultivated native grasses. It propagates very readily from roots. The sets can be extremely small, and if planted in spring they will be plants fully a foot in diameter by the following autumn. The succulence and softness of the leaf render it a most palatable grass, and at the same time enhances its value for hay.

Very close attention has been paid this grass as one of the most promising for cultivation purposes in our wheat-growing districts. Up to date it has proved superior to the native grasses in every way on the Central Tablelands, such as Bathurst, while in the far interior, such as Nyngan, it may prove more lasting under stocking and probably more palatable than the cultivated native grasses.

(*To be continued.*)

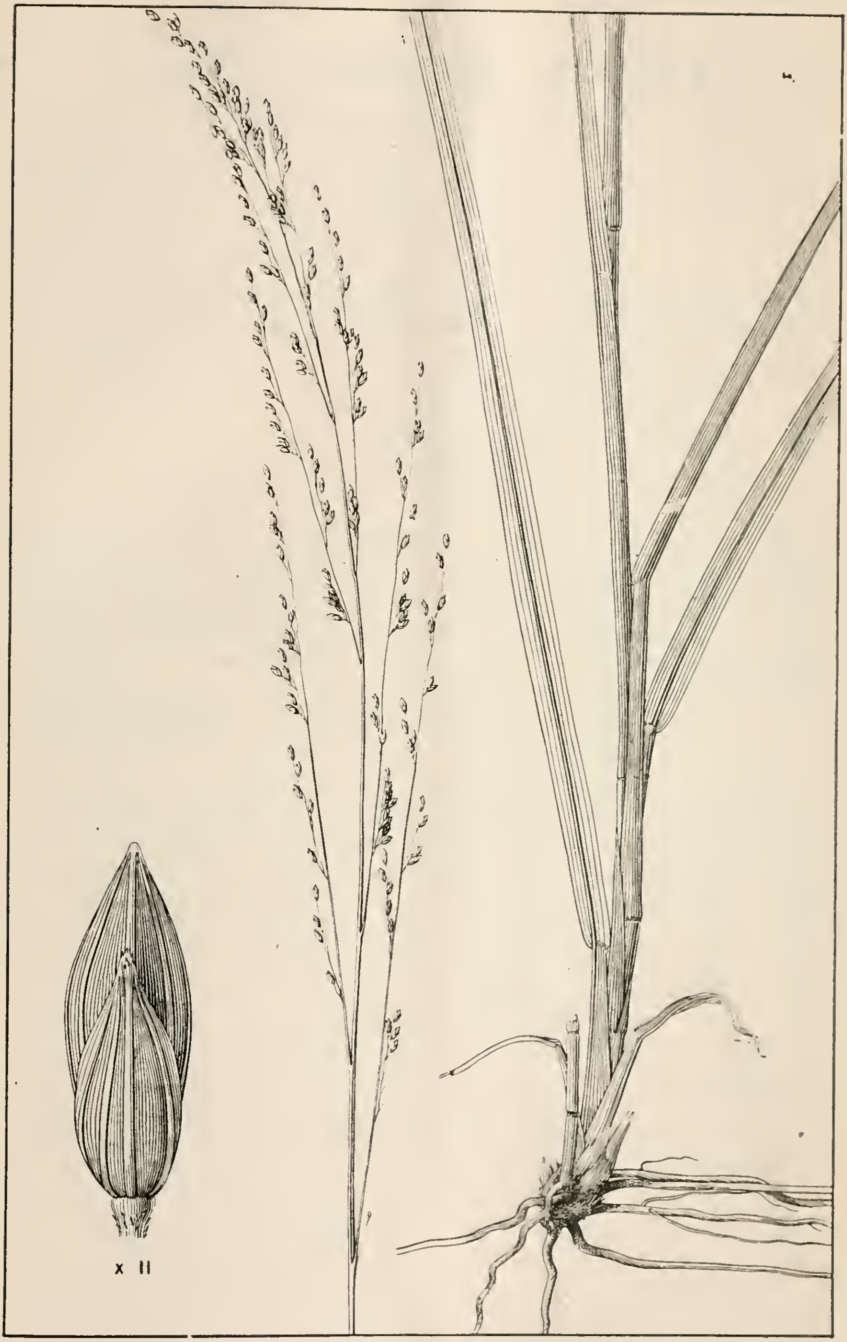


Fig. 3.—Texas Grass (*Panicum bulbosum*).
Distinguished from Guinea Grass by the less dense inflorescence, bulbous root stock, and pointed outer glume of the flower.

POPULAR DESCRIPTIONS OF GRASSES.

Farmers' Experiment Plots.

MAIZE EXPERIMENTS, 1917–18.

South Coast.

R. N. MAKIN, Inspector of Agriculture.

THE undermentioned farmers co-operated with the Department in carrying out maize experiments on the South Coast during the season 1917–18 :—

J. H. Martin, Pambula.
J. Chittick, Kangaroo Valley.
L. B. Garratt, Wickham Hill, Milton.
A. Smith, Curra Creek, Tilba Tilba.
J. Heffernan, Yarragee, Moruya.
The Superintendent, Industrial Boys' Homes, Mittagong.
J. Guthrie, Mogilla, Bemboka.

The season proved a wet one, and the yields in all cases were more or less reduced on account of the prevalence of maize blight, the early maturing varieties being particularly affected. The plots at Mittagong and Bemboka were sown for silage, and unfortunately in both cases they were complete failures owing to the wet conditions. All other plots were sown for grain

At Moruya, a variety trial, including varieties popular in the district, was sown by the following local farmers :—Messrs. A. Louttit, H. Jeffery, B. Flynn, C. Crapp, P. Flynn, and E. Collet. Here again we were extremely unfortunate, as on the farmers meeting to harvest the plots it was found that in many of the sections practically all the cobs had been removed, thus vitiating the returns. However, this has not damped the enthusiasm of this band of progressive men, as another plot has been arranged for the coming season. This was the second occasion in which the farmers had tested their own selections of varieties against those of the Department.

At Pambula, for the first time, three farmers came forward with varieties of their own selection to be tested on the plots.

The effect of the blight was most pronounced at Kangaroo Valley, one variety, Gold Standard Leaming, being completely destroyed, and all the early maturing varieties being badly affected. Leaming did remarkably well. This variety is becoming popular on the South Coast; besides being a good grain variety it is valuable for silage or green fodder, the stems not being coarse. It is, however, not to be compared as a green fodder maize with Improved Yellow Dent, which variety stands alone on account of its high yielding capacity, and its remarkable ability for retaining the juice in the stems until late in growth. A new variety, Potchefstrom Pearl, imported by the Department, yielded fairly well. The grain when dry was very hard, and the stalks were of medium height. The following notes were taken on the varieties as sown at Pambula, where the conditions, both as regards soil and weather, were about average.

Notes on Varieties Grown at Pambula.

	Silvermine.	Hickory King.	Boone County.	Giant White.	Potchefstrom Pearl.	Funk's Yellow Dent.
Average Height of Stalk ..	8 feet.	9 feet.	9 feet.	9 ft. 6 in.	8 ft. 6 in.	8 feet.
Height of Ear	Low.	Medium.	Medium.	High.	Medium.	Low.
Percentage of Two-eared Stalks	20 per cent.	25 per cent	10 per cent.	20 per cent.	5 per cent.	25 per cent.
Amount of Suckering ..	Scanty.	Scanty.	Medium.	Scanty.	Scanty	Scanty.
Thickness of Stalks	Thin.	Medium.	,,	Thick.	Medium.	Thin.
Husk Covering ..	Medium.	,,	,,	Medium.	Poor.	Medium.
Ears Erect or Drooping at Maturity	Drooping.	Erect.	Drooping.	Drooping.	Drooping.	Drooping.
Length of Shank	Long.	Short.	Medium.	Long	Short.	Medium.
Foliage	Medium.	Medium.	,,	Abundant.	Medium.	,,
Strength of Stalk (resistance to lodging)	Good.	Good.	Good.	Good.	Good.	Good.
Maturity Period, in weeks ..	22	23	28	28	28	24
Yield per acre	69 bus.	67 bus. 32 lb	75 bus.	73 bus. 40lb.	86 bus. 44lb.	85 bus.

	Reid's Yellow Dent	Leaming.	Gold Standard Leaming.	Goldmine.	Red Hogan.	Improved Yellow Dent.
Average Height of Stalk ..	8 feet	9 feet.	8 feet.	7 ft. 6 in.	12 feet.	11 feet.
Height of Ear	Low.	Medium.	Low.	Low.	High.	High.
Percentage of Two-eared Stalks	20 per cent.	20 per cent.	20 per cent.	20 per cent.	50 per cent.	20 per cent.
Amount of Suckering ..	Scanty.	Scanty.	Scanty.	Scanty.	Scanty.	Scanty.
Thickness of Stalks	Thin.	Thin.	Thin.	Thin.	Thick.	Thick.
Husk Covering	Medium.	Medium.	Poor.	Medium.	Medium.	Good.
Ears Erect or Drooping at Maturity	Drooping.	Drooping.	Drooping.	Drooping.	Drooping.	Drooping.
Length of Shank .. .	Medium.	Short.	Medium.	Long.	Short.	Short.
Foliage	,,	Medium.	,,	Scanty.	Abundant.	Abundant.
Strength of Stalk (resistance to lodging) .. .	Good.	Good.	Good.	Good.	Good.	Good.
Maturity Period, in weeks .	26	24	24	24	30	28
Yield per acre	69 bus.	69 bus.	68 bus.	79 bus. 48lb.	96 bus.	93 bus. 42lb.

It will be observed from the above notes, taken in the field, that there were some striking features in the case of stems carrying two ears. It was most remarkable in Red Hogan, where 50 per cent. was counted, which largely accounted for the high yield of 96 bushels per acre of this variety. In contrast, Potchefstrom Pearl, the lowest in percentage of two-eared stalks, yielded a satisfactory amount of 86 bushels 44 lb. per acre. The ears of this variety were large, as can well be imagined. Perhaps the best of the mid-season varieties were Funk's Yellow Dent and Goldmine. The former is fast becoming popular with maize-growers on the South Coast, there being now a strong demand for the seed. It is a variety which keeps its character. Red Hogan and Improved Yellow Dent were much later than the other varieties, and resisted the blight well. The season being favourable to them the yields were very satisfactory. The varieties popular in the Pambula district were represented by—

Hickory King (W. Cole) ...	... 94·28	bushels	per acre.
Clarence Wonder (J. Kanter)	... 90·	,,	,,
Mastodon (J. Haywood) ...	... 85·28	,,	,,

There is another instance of acclimatised seed yielding better than that introduced from other parts. This was also the experience at Moruya.

Manurial Trials.

At Tilba Tilba and Milton manurial tests were carried out. The manures used and the results obtained were as follows:—

	Milton.	Tilba Tilba.
	bus.	bus.
Superphosphate, 1 cwt. per acre	64·52	61½
Superphosphate, 1 cwt. per acre; Nitrate of Soda ½ cwt. (top-dressing)	68·8	.. ...
Superphosphate, 2 cwt.	80·	......
P7 (Superphosphate and Bone-dust in equal parts)	80·	66
Special Mixture*	64·48	51
No Manure	50·48	81

* Superphosphate 6 parts, bone-dust 2 parts, sulphate of potash 2 parts.

At Milton Improved Yellow Dent was used for the test, and at Tilba Tilba, Leaming. The soil at Milton was of sandstone formation and responded well to manuring; the plot being situated on a hillside did not benefit from any wash. The Tilba Tilba plot was situated on an alluvial flat, the wash coming from basalt country. It was rather low, as it was afterwards found out, heavy rain causing portion of the patch to be badly washed, which affected the yields to a certain extent. Mr. Smith, in his notes on the growth of the plot, mentions the fact that the yields generally were much higher than on other parts of the farm. The fact of the unmanured section here yielding so much better points to somewhat better drainage on that portion of the patch. On the Milton plot, nitrate of soda was applied as a top-dressing when the plants were well up, but there was too much rain for the best returns from this manure, and it was apparently washed through the soil. The increase of about 3 bushels would certainly pay for the application, but better results would probably have been obtained under better weather conditions.

Superphosphate is undoubtedly very suitable for maize crops—the mixture of superphosphate and bone-dust in equal quantities (P7), applied at rate of 2 cwt. per acre, being very satisfactory. On many soils this may with advantage be applied at a heavier rate.

The special mixture—superphosphate (six parts), bone-dust (two parts), and sulphate of potash (two parts)—recommended as having given good results in South Africa, when used at 2 cwt. per acre, needs further trial here. The returns during the past season were disappointing; it should, however, be a good mixture, and when potash supplies are again available something further might be done in testing it.

Seed and manure on all plots, except Moruya and Pambula, were sown with the maize planter, in rows 4 feet apart, dropping about three grains every 3 feet. At Pambula the plot was check-planted about 2 feet 9 inches each way; the manure was spread along open drills by hand. All crops were worked in the usual manner. Smutted cobs or stalks were conspicuous by their absence, but there was a heavy loss in some districts from leaf blight, which apparently flourishes in wet seasons.

Northern Districts.

R. W. McDIARMID, Inspector of Agriculture.

MAIZE experiments were conducted at the following places during the last maize season :—

J. F. Chick, Tenterfield.
J. T. Cowin, Tenterfield.
C. Hatcher, Inverell.
L. M. Rixon, Uralla.
W. Lowry, Quirindi.

Plots were also sown at Red Range (near Glen Innes) and Dungowan, near Tamworth, but were destroyed by excessive rains and flooding.

The Season.

Throughout the district the season was extremely wet during the spring and summer months, but a dry autumn followed. The growth was affected in each instance owing to the drowning of a number of the young plants and the unavoidable growth of weeds, which could not be successfully dealt with under the wet conditions.

The large number of rainy days and the accompanying cool weather was also responsible for a substantial check in the growth.

The plots at Tenterfield on Mr. J. F. Chick's farm were located on a hillside, and were considerably scoured by the rains, causing the soil and fertilisers to wash from the higher ground to the lower levels. This resulted in diminished yields on the higher land. The results are therefore not comparable.

Cultural Notes.

Tenterfield.—At Mr. J. F. Chick's farm the land the previous year carried maize, which had been manured with superphosphate at the rate of 1 cwt. per acre. The plot was ploughed in August, and cultivated and drilled on 1st November. The crop had several cultivations during growth, and the top-dressing was applied on 12th December.

At Mr. J. T. Cowin's property the land was cropped to oats the previous season; these were sown without manure, and were harvested for hay. The ground was ploughed in August and harrowed twice, cultivated and drilled in on 30th October. The growing crop was cultivated several times, and the fertiliser for top-dressing was applied on 15th December.

Inverell.—The land here was fallowed the previous year. It was ploughed in July and again in September, and harrowed. The seed was drilled in without manure on 5th October in rows 4 feet apart. The fertilisers were applied during growth, as follows :—Plots 1 and 2, 12th November; plots 3 and 4, last week of December. The crop was cultivated twice during the early stages of growth.

Uralla.—Oats occupied the land the previous year; these were grown without artificial fertilisers. The land was ploughed on 26th July, harrowed, and again ploughed in August. It was cultivated twice and rolled in October, the seed being sown in 3-foot drills on 20th October. The growing crop was cultivated twice during the early stages, and the top-dressing was applied at the time of the last cultivation on 6th December.

Quirindi.—The previous crop here was wheat, which had been grown without fertiliser and cut for hay. The stubble was ploughed under in the autumn and again in the spring. Sowing took place by following the plough on 5th November, and was in drills 4 feet apart. The growing crop was cultivated and hilled well during the early stages.

TABLE A.—Showing Results of Maize Manurial Trials, Northern Districts.

Variety—Early Yellow Dent.

Manure.	Tenterfield, J. F. Chick.*		Tenterfield, J. T. Cowin.		Uralla. L. M. Rixon.	
	bus.	lb.	bus.	lb.	bus.	lb.
No manure	33	0	15	52	24	16
Superphosphate, ½ cwt	17	0	22	50	......	
Superphosphate, 1 cwt.	29	16	21	0	20	40
Superphosphate, 1 cwt.; Nitrate of Soda, ½ cwt.	20	0	25	10	20	50
P7 Mixture, 1 cwt.†	15	0	20	14	......	
P8 Mixture, 1 cwt.‡	......		17	6	......	

* Results at Mr. Chick's farm are not comparable, owing to heavy storms. † Equal parts superphosphate and bone-dust. ‡ P8 Mixture consists of superphosphate 6 parts, bone-dust 2 parts, sulphate of potash 2 parts.

TABLE B.—Showing Results of Maize Top-dressing Experiment at Inverell.

Manure per acre.	Yield per acre.		Date of applying Fertiliser.
	bus.	lb.	
Superphosphate, 1 cwt.	40	0	12th November.
Superphosphate, 1 cwt.; Nitrate of Soda, ½ cwt. ...	33	12	,, ,,
Superphosphate, 1 cwt.	38	52	End of November.
P5 Mixture, 70 lb.	41	34	,, ,,
No manure	43	5	....

TABLE C.—Showing Results of Maize Variety Trial at Quirindi.

Variety.	Superphosphate per acre.	Yield per acre.
	lb.	bus.
Funk's Yellow Dent	30	15
Early Yellow Dent	30	22
Silvermine	30	20
Hickory King...	30	failed.

Conclusions.

The season's experiments reveal very little of an educational character owing to the abnormal climatic conditions with consequent inferior growth, the loss of the plots at two centres through floods, and the loss of comparability through scouring at Mr. J. F. Chick's farm at Tenterfield.

Where the yields are comparable, at Mr. Cowan's plots, of Tenterfield, and Mr. Hatcher's, of Inverell, very little is demonstrated other than the value of fertilisers at Tenterfield and their apparent ineffectiveness at Inverell.

In the cases where the fertilisers were applied during the growing stages, the results have not favoured such applications except in one instance with nitrate of soda at Mr. Cowan's, of Bryan's Gap, Tenterfield.

Western District.

J. E. SYME, Assistant Inspector of Agriculture.

These experiments were carried out by Mr. R. G. May (now Manager of the Bathurst Experiment Farm) on the farms of—

John Jones, Moorbel, Canowindra,
E. J. Allen, Gregra,
A. E. Draper, Alectown West,

to whom thanks are due for the interest displayed in the work and the cordial co-operation afforded at all times.

A plague of mice destroyed a good deal of the maize on the ears in the paddock at Alectown West, so that no authentic results were obtained.

Experiment at Canowindra.

The land at Canowindra consisted of black alluvial flats, and was ploughed about 9 inches deep at the end of the winter, harrowed, and again ploughed 5 inches deep at the end of September. It was then harrowed and rolled, being in excellent condition at the time of ploughing. Furrows were opened out on 2nd November, 3½ feet apart, with a mouldboard plough and the maize drilled in at the bottom of the furrow, three grains being dropped every 3 feet. The after-cultivation consisted in twice horse-scarifying and once hand-hoeing.

Unfortunately, when harvesting the manurial trials with Funk's Yellow Dent they became accidentally mixed, and the yield given is only an average of all the plots.

The results are very satisfactory, as may be seen from the following table, Silvermine returning 111 bushels per acre, while Funk's Yellow Dent and Chester County returned 102 bushels each.

The variety trials were sown without manure.

Table showing Yields of Maize Variety Trial at Canowindra.

Variety.	Yield per acre.	Variety.	Yield per acre.
	bus.		bus.
Improved Yellow Dent ...	75	Early Yellow Dent ...	85¾
Gold Standard Leaming...	69¼	Chester County	102¼
Boone County	81¾	Silvermine	111¼
Prairie Queen	72¾	Funk's Yellow Dent ...	102¾
Leaming	75	Yellow Mastodon ...	75¾

Experiment at Gregra.

The land occupied by this experiment was of a red loamy nature. It was ploughed the first time in April, 3 inches deep, and then harrowed. It was again ploughed 5 inches deep in August, harrowed, cultivated with the spring-tooth twice and sown in furrows 3 inches deep and 6 feet apart, three seeds being dropped every 3 feet on the 16th October. The land was then harrowed twice. After-cultivation consisted of spring-toothing between the rows twice and harrowing once.

The maize in this experiment suckered very little, and the average height of the cobs was about 4 feet. The cobs were all well filled except in the case of Prairie Queen, which was poor in this respect. The shanks were short and the cobs erect.

The results of the manurial trials show a decrease due to the manures up to 7 bushels per acre, except in the case where ½ cwt. of nitrate of soda was used as a top-dressing applied six weeks after planting to maize manured with 1 cwt. of superphosphate per acre.

The rainfall during the growing period was 19 inches 71 points.

Table showing Results of Maize Manurial and Variety Trial at Gregra.

Variety.	Manures and Amount per acre.	Yield per acre. bus.	Yield per acre. lb.
Funk's Yellow Dent ...	½ cwt. superphosphate	27	42
,, ,, ...	1 cwt. superphosphate and ½ cwt. nitrate of soda.	28	42
,, ,, ...	1 cwt. superphosphate	23	20
,, ,, ...	½ cwt. P 7 mixture	21	52
,, ,, ...	No manure...	27	44
Silvermine...	....	28	4
Chester County	....	22	32
Early Yellow Dent ...	....	23	48
Reid's Yellow Dent ...	....	25	32
Hickory King	....	20	8
Prairie Queen	....	21	0
Potchefstrom Pearl ...	....	22	48
Gold Standard Leaming ...	....	24	0
Farmers' variety	....	23	20

LIST OF PLANTS DECLARED TO BE NOXIOUS IN VARIOUS SHIRES DURING SEPTEMBER AND OCTOBER, 1918.

Plant.		Shire.
Scientific Name.	Common Name.	
Echium plantagineum ...	Blue Weed or Paterson's Curse.	Waugoola.
Hypericum perforatum ...	St. John's Wort ...	Waugoola.
Inula graveolens	Stinkwort	Waugoola and Goobang.
Linaria elatine	Hairy Toad Flax ...	Burrangong.

Mendelism in Relation to Plant Breeding.

J. T. PRIDHAM, Plant Breeder.

THE laws of inheritance discovered by Mendel are of service to the plant breeder in showing the possibility of securing any desired combination of qualities in the progeny of a crossbred, provided that sufficient numbers of crossbred seeds are sown and that the qualities existed in one or other of the parents.

Investigations have proved that certain morphological characters are dominant and that others are recessive, and we may ensure that the required character, if recessive, breeds absolutely true until the type is upset by the effect of natural crossing in the field. To be economically useful, however, the type desired must be productive; and the quality of productiveness or yielding power depends upon a number of factors. Indeed, we cannot say what factors do not influence the quality of productiveness. Continuous culture alone will determine whether the type chosen is sufficiently productive to be worth persevering with. In breeding a high-yielding type, Mendel's laws have shown that forms may be discovered which have a higher yielding capacity than either parent and combine the desirable qualities of each; this is of great importance. Such individuals will appear in the third generation from the cross.

The chief assistance Mendelism affords, in dealing with the morphological characters, pair by pair, is in regard to the dominance or recessiveness of such characters. A bearded wheat being dominant to beardless, one could more quickly fix the beardless character than the bearded; for recessive forms breed true, while dominants normally continue to vary. In some cases the character is not simple; for instance, the black colour of the glumes of some oats consists of two factors, and the Mendelian ratio when crossing a black-glumed with a white-glumed oat comes out as 15 black to 1 white instead of 3:1.

If possible, all the offspring of a cross should be grown and reaped separately, plant by plant, till the fourth generation. This entails a great amount of labour; and even when the desired type is isolated, it cannot be said to be permanently fixed if it is to be grown in our climates. Therefore continuous selection must be maintained, for sooner or later natural crossing intervenes and upsets the type unless it is by this means kept pure. Some of the variation and impurity seen in field crops is due to this natural agency; for in spite of special care in cleaning out machines on the State Experiment Farms, types will be found which cannot be identified with any variety previously grown on the farm or imported from abroad. We have found natural crossing in the following varieties of wheat:—Bunyip, Canberra, Federation, Firbank, Hard Federation, Huguenot, Marshall's No. 3, Purple Straw, Rymer, Thew, Warren, Yandilla King, and Zealand.

It may be said that these are mostly crossbred wheats which have never been properly fixed and are now reverting from type. But we have found a number of natural crossbreds in Indian varieties which have never been artificially crossed. Some years ago we found the variety of wheat now known as Hard Federation varying in the colour of its ear; some being almost white, while others were brown like the present type grown. After a few seasons the pale-eared strain was eliminated and the brown-eared sort appeared to be fixed. Before long, however, variations made their appearance; not in colour of ear as before, but variations in shape of ear, degree of tip-awn, and in earliness.

There are, of course, fluctuating variations due to environment which do not appear again unless precisely the same conditions recur which gave rise to them. Other variations breed true and are of the nature of a "sport." A departure from type due to natural crossing is a third kind of variation, and the seed from such an individual yields progeny varying in the same way as the progeny from an artificial crossbred. A moderate degree of variation need not cause alarm; it may be regarded as a sign of vigour. It would seem to be a provision of nature to ensure a crop of seed from some individuals whatever the character of the season may be.

The foregoing observations will make clear the necessity for regular and systematic selection, and the experimenter must not be deceived by the greater vigour of individuals showing variation in their progeny. This is the stimulating effect of natural crossing and will pass off in two or three seasons. Selections from such material will have to be compared with standard varieties for several years before passing judgment upon them.

The plant breeder must work on Mendelian lines in so far that the individual plant is the unit—the seed of two apparently identical plants must be kept separate—and that it is necessary to work with large numbers. Provided that he selects each season the type he is in search of and does not aim at two mutually antagonistic qualities such as heavy yield and extreme earliness, he may expect to reach the end in view. The time taken will depend on the judgment and patience exercised and the number of plants available.

In the words of John Belling*—" If, then, the breeder of improved plants uses pedigreed lines (centgener plots or ear-to-row tests) instead of mixed cultures and selects in each generation the plants which are most prepotent for *the particular characters* he needs, he can, I think, usually leave Mendelian formulæ to those who are working to discover new facts."

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* Florida Agricultural Experiment Station in "Heredity," Jan., 1915.

Studies in "Black Disease."

A BRAXY-LIKE DISEASE OF SHEEP.

[Continued from page 804.]

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As already indicated, it was recognised that work on the cause of Black disease carried out with the materials then available would not be productive of conclusive results, because on account of such materials being obtained from sheep found dead, no matter how recently the death appeared to have taken place, the objection could always be raised that organisms so obtained, especially anaerobes, were possibly post-mortem invaders. To meet such objections as far as possible, any materials. *e.g.*, blood, exudates, portions of organs, &c., must be removed from animals affected with Black disease immediately the animal had been seen to die naturally or had been killed, with, of course, every precaution to avoid contamination.

The research work during the seasons 1915, 1916, and 1917 was carried out on those lines. As the symptoms of the disease are so indefinite, and death takes place so rapidly and unexpectedly, it was realised that the only way to see sheep alive was to watch the various flocks during the whole day, from daylight to dark. On account of the distance of the paddocks from the homesteads, this at times necessitated camping out with the sheep for several days at a time. Such a procedure, although attended by some inconvenience on account of frost and rain, was amply rewarded, inasmuch as a total of twenty affected sheep were detected by this means alive and in various stages of the disease. Autopsies were held immediately after they had died naturally or were killed. Numerous post-mortem examinations were also made upon sheep found dead of Black disease, but no materials for experimental work were taken from these latter animals, except for control.

The mortality from Black disease during the 1915 season was very heavy. This may to some extent have been influenced by the drought conditions then prevailing. In the 1916 season the mortality, on the other hand, was lighter than usual. the season that year, so far as food was concerned, being very favourable for stock in general. In 1917 the losses from Black disease were so light that little field work could be done.

Although, as related, twenty cases of Black disease were detected during life and autopsies held immediately after death, the post-mortem appearances were upon the whole fairly constant. Details of one case are given in order to present a picture of the microscopic lesions of this disease.

Case 8.

Wether, aged 5 years; fat condition; found ill in paddock early in the morning. The animal was able to walk, and even run a short distance when approached. When brought to the hut where the autopsies were held, the illness had visibly increased. Sensibility was retained but the sheep made no attempt to move, lying on its side. The respirations were shallow, and the pulse hardly perceptible. About an hour later the breathing grew stertorous and deep; the animal became comatose. This condition having lasted about fifteen minutes, the sheep was killed, and a post-mortem examination made immediately.

Autopsy.—About 300 c.c. of quite clear, straw-coloured fluid in the thoracic cavity; lungs apparently normal; pericardium distended with a fluid resembling that in the pleural sac; heart presented extensive endocardial hæmorrhages; peritoneal cavity contained several hundred c.c. of slightly turbid liquid; connective tissue of the various compartments of the stomach markedly œdematous; gastric, hepatic and mesenteric lymphatic glands swollen, congested and œdematous; kidneys congested; spleen normal. Liver.—The posterior surface was covered with flakes of fibrinous lymph. The organ was very dark and congested; moderate fluke; two hæmorrhagic areas, each about the size of a shilling, were present, also a dirty yellow necrotic area about the same size. Abomasum.—Mucous membrane a little œdematous. No hæmorrhages or congestion, save immediately surrounding the pylorus, where there was a deeply congested submucous area about an inch wide. Mucosa of duodenum fairly deeply congested, with a few petechiæ. Jejunum intensely congested, mucosa showing many small hæmorrhages, with actual blood in the lumen. Ileum—congestion by no means so pronounced. Large intestines normal. No muscular lesions. Subcutaneous blood vessels congested.

From various of the twenty fresh cases, materials, *e.g.*, blood, exudates, portions of organs, &c., were removed with the utmost care to avoid contamination, and placed immediately in sterile receptacles, or aspirated direct into pipettes and sealed at once. The materials so obtained were taken to the laboratory, and such as remained uncontaminated were used for subsequent experimental work, *e.g.*, inoculations, cultures, &c. In some cases it was found, as was anticipated, that in spite of the care taken, some of the specimens had become contaminated. These were discarded. A number of the sealed pipettes, containing blood or exudate, were incubated before being used. In addition to the above, various specimens were placed in preservative, and smears made for histological and bacteriological examination.

In some instances, as soon as the animal was dead the abomasum and intestinal tract, portions of organs, &c., were minced up, and a relatively large amount of the mixture administered by the mouth to sheep.

In other cases, sheep were inoculated on the spot with varying amounts of heart blood within a few minutes of death of the animal from which it was taken.

Result of Examination, Microscopical and Cultural, of various materials removed from Sheep immediately after Death.

Smears were made from the pericardial, pleural and peritoneal exudates, heart blood, liver, kidneys, spleen, lungs, lymphatic glands, and such other places as thought desirable, but no bacteria could be detected in them microscopically, except from the liver of one case. Here an occasional bacillus of the Colon type was seen.

Cultures, both aerobic and anaerobic, on a variety of media from the above materials (in some cases the pipettes of fluid were incubated before opening) proved quite negative with the exception of the following. Instances of obvious contamination are not enumerated :—

(*a*) Liver and mesenteric gland, Case 14.—A bacillus of the Colon type. Experimental inoculation showed that it was not the cause of Black disease.

(*b*) From the same organ, cultures of portion of a necrotic focus. A long, thick anaerobic bacillus, which was not pathogenic either to guinea-pigs or rabbits upon subcutaneous inoculation.

(*c*) Hepatic lymphatic gland, Case 15.—A short bacillus, anaerobic. Fatal to a guinea-pig in dose of ·5 c.c., but not to sheep in doses of 2 c.c, 3 c.c., and 15 c.c.

(*d*) A short anaerobic bacillus from the liver of Case 16.—Produced no reaction in guinea-pigs, rabbits, or sheep.

(*c*) From the adrenal gland of Case 17, also the lung.—An anaerobic bacillus, which was experimented with more extensively. Details are given later.

(*f*) From the Mediastinal lymphatic gland, Case 19.—An anaerobic bacillus. A number of experiments were also made with this organism. Details given later.

Inoculation Experiments with fresh materials taken from Sheep affected with Black Disease immediately after Death.

Sheep, guinea-pigs, and rabbits were inoculated subcutaneously with varying amounts of heart blood, pericardial, pleural and peritoneal exudates, and emulsions in saline solution of kidneys, liver, spleen and lymphatic glands from sheep dead of Black disease, the various materials being removed directly after death, and placed in sterile receptacles with every precaution. In some instances, intraperitoneal injections into sheep were made, but the result was invariably negative.

Morbid Histology.

Sections were prepared from portions of abomasum, intestines, liver, kidneys, lymphatic glands, and other parts showing lesions, with the following results :—

In the small intestines and the congested areas of the abomasum, the blood vessels are greatly engorged, and there is a round-celled infiltration of the surrounding tissues. Occasionally, extravasations of blood on to the surface of the mucosa are seen. In those instances where the tissues have been removed immediately after death, and placed at once in fixative solution, no bacteria have been demonstrated in these congested areas, although some may be present in the exudate on the surface; but when the removal of the tissue has been delayed, varying numbers of bacteria can almost invariably be found in such localities.

The blood vessels of the kidneys are also engorged, and the parenchyma shows cloudy swelling. No bacteria were seen when the organs were removed directly after death.

The same condition may be observed in the liver, except in the hæmorrhagic and necrotic areas. In the former, the blood vessels are often so swollen, or extravasation has occurred, that the amount of liver tissue in the section may be relatively small. No bacteria have been detected in such areas when the material has been removed immediately death has occurred. The necrotic foci have a rather well-defined margin, which shows only a moderate leucocytic invasion. Around the circumference also, and extending over the necrotic area, are often fairly large numbers of bacilli, non-sporing, straight, rather long, but never approaching the filamentous. The rods usually appear single. These bacteria are apparently secondary invaders, as the hæmorrhagic areas which are apparently the precursors of the necrotic foci, are quite bacteria-free provided post-mortem invasion has not been allowed to occur. With the liver, as with other organs, various bacteria may be demonstrated if the removal of the tissue is delayed. Sections of spleen have been bacteria-free; the same with lymphatic glands if the proviso mentioned has been observed.

From the description of the morbid anatomy and histology of sheep dead of Black disease, it will be seen that the indications are those of a severe toxæmia, although nothing has been demonstrated either clinically or experimentally to account for this condition. Some of the changes which have been often described in this and similar conditions affecting sheep, and considered to be part of the morbid anatomical features, viz., production of gas, the colouring of the various exudates rendering them either sanguinolent or very turbid, the bloodstaining of the tissues, dissolution of the surface of the mucosa of the abomasum, the softening of the kidneys, the clay-coloured appearance of the liver, are apparently purely post-mortem changes.

Furthermore, a feature of importance in allocating any special rôle to bacteria found in sections from sheep dead of Black disease is that when such sections were prepared from material taken from sheep *found dead*, although such death was very recent, bacteria could generally be demonstrated in such sections, especially in the greatly engorged blood vessels. When, however, similar sections were taken from sheep directly death had occurred, and placed in fixative immediately, bacteria were conspicuous by their absence, except in the necrotic foci mentioned. The indications, therefore, are that such bacteria are probably post-mortem, or at least agonal invaders. In the latter case, a few bacteria, although undemonstrable when the material was removed directly after death, would in a very short time, in the carcase of the sheep, have multiplied to such an extent as to become readily demonstrable under the microscope.

With regard to the ecchymoses in the heart wall and other places, it is probable that such are of agonal origin. Cardiac hæmorrhages appear to be rather common in sheep dying from a variety of causes.

Précis of experimental work, both Field and Laboratory, performed during the Seasons 1915–16–17.

Twenty sheep were discovered ill with Black disease on various stations at different periods. They were autopsied immediately after they had died naturally or had been killed. Morbid anatomical pictures were thus obtained before post-mortem changes could have supervened. Various materials were removed with the greatest precautions to prevent contamination, and taken to the laboratory for examination and experiment. Smears were prepared at the same time from blood, exudates, organs, &c.

In addition to the above twenty cases, numerous post-mortems were made upon sheep found dead in the morning, although apparently well overnight. In view of the results already obtained in dealing with such cases, and of the liability to draw erroneous conclusions in experimenting with materials taken from them, the decision of refusing to use materials for cultivation and experimental inoculation unless they were obtained immediately after death and from animals seen to die, was rigidly adhered to, except that occasionally control cultures were made from sheep found dead.

Microscopic examination of smears taken from the twenty cases in question failed to reveal the presence of any bacteria, except with regard to the liver of Case 14, where a bacillus of the Colon type was seen; experiments showed that this was not the cause of Black disease.

Microscopic examination of smears taken from animals found dead, showed various species of bacteria in greater or fewer numbers. At times none could be demonstrated microscopically even in these; it depended chiefly upon the length of time the animal had been dead. Histological examination of sections from various parts removed from the cases immediately after death, showed profound changes, but even in the morbid areas no bacteria could be demonstrated, save in the necrotic foci, and here the organism was apparently a secondary invader; also in the liver of Case 14, where a bacillus of the Colon type was demonstrated.

In sections of affected parts taken from animals found dead, although death may have appeared only to have just taken place, *e.g.*, the congested areas in the intestines, stomach, or liver, &c., bacteria of varying species, but in which those having the morphology of the Braxy type predominated, could almost always be demonstrated. At times this type appeared to be the sole invaders of the tissue under examination.

A great number of tubes of culture media were inoculated with various exudates, organs, blood, &c. Frequently the blood and exudates were incubated in the originally sealed pipettes before planting out in tubes. Tubes showing growths which were obviously the result of accidental contamination are omitted from mention. A variety of media was employed, both aerobically and anaerobically. As the indications were that if the cause were bacterial at all, it would probably be an anaerobe, most attention was paid to anaerobic cultivation, especially as the majority of the bacteria isolated were anaerobes. The medium finally decided upon as being the most satisfactory for growth, sporulation and maintenance of virulence of such anaerobes as were isolated, was a serum-formate-bouillon, the serum being non-coagulable by heat. Although a medium containing glucose and serum gave an abundant and very rapid growth, its use was abandoned for sub-cultivation or purposes of inoculation, as it was found that the cultures quickly lost their virulence, and that very few spores were formed.

Excluding instances where the growths were manifestly the result of accidental contamination, tubes inoculated from various materials from the twenty cases mentioned remained sterile, except in the following instances:—

Liver and mesenteric lymph gland, Case 14.—A bacillus of the Colon type was isolated; also from a necrotic focus in the liver of the same animal, an anaerobic bacillus which was non-pathogenic to the experimental animals.

Hepatic lymphatic gland, Case 15.—A short anaerobe, pathogenic to guinea-pigs in relatively large doses, but not to sheep in large doses.

Liver, Case 16.—A short anaerobe, non-pathogenic to sheep, guinea-pigs, or rabbits.

Lung and adrenal gland, Case 17.—An anaerobe which upon subcutaneous inoculation into sheep produced varying results, was fatal to guinea-pigs in rather large doses, but non-pathogenic to rabbits.

From mediastinal lymph gland, Case 19.—An anaerobe, morphologically of the Braxy type, which upon subcutaneous inoculation produced varying results in sheep, was very fatal to guinea-pigs even in very small doses, but non-pathogenic to rabbits.

The feeding of sheep with blood, exudates, and minced-up viscera produced no evident effects.

Subcutaneous injection of varying amounts of blood, exudates, and emulsions of organs, &c., taken from animals dead of the naturally acquired disease directly after death, into sheep, guinea-pigs and rabbits, was quite negative. Intraperitoneal injection of certain materials into sheep was also without positive result.

No bacilli of the hæmorrhagic septicæmia type were detected at any time, either microscopically or culturally, from natural or experimental cases.

Serological tests with various bacteria isolated and the serum of sheep dead of Black disease were carried out, but the results were not such as to encourage one to persevere.

Remarks upon the Field and Laboratory work conducted during the Seasons 1915-16-17.

The point which immediately attracts attention is the striking difference between the results obtained in 1914 and those obtained during the subsequent seasons. In the former case the animals from which the materials for experimental work had been obtained were not seen alive, but had been dead an unknown, although not very long, period—at the most only a matter of a few hours—and during a cold season of the year. In the latter case the animals were seen alive, and the materials were taken from them immediately after they had died naturally or had been killed. It also shows that a number of the changes observed upon autopsy of animals found dead were merely post-mortem in origin and not part of the morbid anatomy of Black disease.

Materials taken from sheep found dead, and inoculated subcutaneously into healthy sheep, invariably resulted in death; and bacteria could be isolated and cultivated from such sheep, and also from those dead as the result of experimental inoculation with these bacteria, sometimes in purity and sometimes mixed. Certain of these anaerobic organisms were either fatal on injection to sheep, or resulted in pronounced local lesions. No effect, however, could be produced upon oral administration of minced-up organs and portions of alimentary tract of naturally dead animals, or of large cultures of organisms which were so fatal on par-enteral injection. Such bacteria, too, were very fatal upon inoculation to guinea-pigs, but not to rabbits.

On the other hand the subcutaneous or intraperitoneal inoculation of blood, exudates, or emulsions of organs, &c., removed from animals directly they had died of Black disease, with every care to avoid contamination, failed to produce any distinct reaction, even although large doses were often injected.

The feeding of sheep with minced-up viscera from such cases was without evident effect, as also in the case of similar material from the animals dead an unknown period.

In the case of sheep found dead of Black disease, certain bacteria could be demonstrated microscopically in most instances in the blood, exudates, and organs, the number depending upon the length of time the animal had been dead. In the congested areas in the stomach, intestines, and liver, sections also showed fewer or larger numbers of bacteria, often apparently of only one species. The commonest organisms were (1) a bacillus morphologically of the Braxy type, and (2) a bacillus of the malignant œdema type. The former organism, when injected subcutaneously, could invariably be recovered by cultivation from the heart blood of the experimental sheep or guinea-pigs after death, and also from the subcutaneous exudates. If smears of the heart blood, and in some instances pericardial, pleural, or even peritoneal exudate, were taken directly the experimental animal had died, it was often impossible or difficult to detect any bacteria by microscopic examination, although, as just stated, they could always be obtained by cultivation of such apparently sterile materials. Large doses of such bacteria also, administered by the mouth to sheep, failed to produce Black disease.

If one compares these results with those obtained with materials taken from sheep immediately after death, it will be seen that in the majority of these latter cases no bacteria at all could be demonstrated, either in smears or sections, in the congested areas in the stomach and intestines, and also in smears, cultures, sections, or by animal experiment in the liver, kidneys, lymph, glands, spleen, heart blood, &c. Also, whereas in the former cases bacteria could be demonstrated in the submucosa and the engorged blood vessels, in the latter, where the material had been removed and placed in fixative directly after death, no bacteria could be seen at all in such situations. Of course, bacteria could often be found on the surface of the alimentary mucous membranes, particularly in the exudate. Cultivation of various materials from these sheep was usually negative, the exceptions being either apparently instances of secondary invasion; or in the instance where an organism proved to be pathogenic, the number of cases from which it was isolated were too few to permit one to definitely consider what rôle it played, if any, in the cause of Black disease.

In some instances, such as with the liver and mesenteric glands, the growths obtained were of a mixed character. This does not necessarily indicate that contamination had occurred after the material had been removed from the body. In fact, in the light of present-day knowledge, one would not be surprised to be able to obtain growths of certain bacteria from these situations, even from a healthy carcase. At first, however, these organisms were tested by animal inoculation in order to make sure that such were not the cause of Black disease.

Another feature worthy of note is the result of inoculations and cultivation of blood from the heart of various animals. Bacteria primarily isolated from sheep found dead could, upon the death of an experimental sheep or guinea-pig, always be cultivated from the heart blood, even if such material were aspirated directly the heart had stopped. Only occasionally could such results be obtained from the heart blood of sheep taken directly after death from Black disease, and even then such bacteria did not produce any serious results upon inoculation to sheep. Bacteriological workers will need no reminding that the mere finding of an anaerobic organism in the heart blood of a dead animal by cultural methods, especially such a one as the sheep, is no proof whatever in itself that it was the cause of death, even although such an organism is highly pathogenic to certain animals upon par-enteral injection.

If from the first one had been content to proceed on the assumption that the organism of the Braxy type isolated during the work of 1914, and which was so markedly pathogenic to sheep and guinea-pigs par-enterally, was the cause of the disease under investigation, one might, no doubt, have built up a very nice structure based upon experimental work performed with the organism in question; but, unfortunately, it would have been erected upon a very insecure foundation, as no proof had been furnished that the organism was present in the tissues or fluids of the body before death. The experiments conducted during 1915–16–17 show that the critical attitude of mind in refusing to accept the evidence furnished by sheep found dead of Black disease as conclusive, was amply justified. They also confirmed the opinion formed as the result of experimental work in 1914, viz., that no conclusion of any value was to be drawn in connection with Black disease from the cultivation and experimentation with anaerobes isolated from animals found dead.

The conclusion to be drawn from the research work narrated is that the bacteria isolated from the blood, exudates, organs, &c., of sheep found dead of Black disease, including that of the Braxy type, are agonal or post-mortem invaders. They may also invade the blood, &c., just prior to the death agony in such diseases as the one in question. It may be held that the latter type of bacillus was actually the causal factor, but that during life it was localised at some spot, and was confined thereto until the death of the animal, when it rapidly spread throughout the body, somewhat like the bacillus of blackleg, death being brought about by the production of a very powerful toxin. This might be considered a reasonable explanation if one could demonstrate that the particular bacterium was constantly present in lesions. This could be done with regularity in the case of tissue removed from animals found dead, *e.g.*, in the submucosa of the congested areas of the abomasum or small intestines, but unfortunately they could not be found at all in similar tissues taken directly after death. Furthermore, contrary to what is usually the case in blackleg, although there are exceptions in this latter disease, no subcutaneous muscular lesion was detected. There remains the instance of Cases 17 and 19, where certain bacteria were isolated from fresh carcases and proved to be pathogenic. The one obtained from the lung and adrenal gland of Case 17 was apparently a malignant œdema type of bacillus. Experimentally it did not produce Black disease, and the conclusion is that it was a pre-agonal or agonal invader. With the bacillus isolated from Case 19, this at first sight might be thought to substantiate the view that the Braxy type of bacillus was the cause of the disease. It, however, might just as well be considered to have the same origin as the malignant œdema type of bacillus isolated from Case 17. Even if it does play the premier rôle in the causation of Black disease, it will have to be found more constantly in animals immediately they have died from that disease, before its etiological significance could be considered to be established.

So far as the hypothesis that the Braxy type of bacillus is confined during life to the surface of the stomach or intestines, and that it does not invade the body until after death is concerned, that view is reasonable, but not easy of proof, as most of the intestinal anaerobes will produce very serious results when injected into certain animals par-enterally. Furthermore, examination of smears from the intestinal walls and contents of affected animals has not shown the bacillus in question to be unduly numerous. In addition, it has been shown that attempts to convey the disease by feeding sheep with minced-up viscera or cultures have hitherto failed, although undue importance should not be attached to this when discussing the possible bacterial origin of Black disease. It does not prove that infection *cannot* occur *viâ* the alimentary tract.

I am aware it is considered by many bacteriologists that the malignant œdema bacillus, the Braxy bacillus, and the bacillus of blackleg belong to one group. All that is intended to be conveyed here at present, when speaking of a Braxy type and a malignant œdema type of organism, is that culturally and morphologically the two species of bacteria had characteristics which served to differentiate them into those two classes.

Hypothesis as to the cause of Black Disease.

Various explanations have been advanced as to the cause of the disease in sheep known as Black disease. They may be grouped under four chief headings, viz.: (1) bacteria; (2) plant poisoning; (3) a deficiency disease or absence of a vitamine; (4) a filtrable virus.

The fourth hypothesis, that the condition is due to an ultra-visible or filtrable virus, may be dismissed very briefly. The negative results following injection of large amounts of blood, exudates, or emulsions of organs from affected sheep apparently rule this view out from present consideration. The other three views need fuller discussion.

1. Bacteria.—The morbid anatomy of sheep dead of Black disease indicates a condition of toxæmia, but up to the present researches have failed to demonstrate with any degree of constancy the presence in the blood, tissues, or exudates of bacteria which could be shown to have been there before or at the time of death. The instances in which bacteria were demonstrated to have been present at such periods were not enough, compared with those in which none were found, to permit of any generalisation, even if such bacteria had produced Black disease experimentally. In spite of such results, it is quite possible that the cause is bacterial, the organisms being confined to the lesions, or to the intestinal tract, whence a very powerful toxin is given off. Unfortunately, however, up to the present, examination of sections from the lesions have failed to definitely reveal any bacteria which can be said to play a causative rôle in the disease under consideration. Furthermore, the injection of emulsions of congested portions of liver were without positive result. It need hardly be stated that the injection of an emulsion of congested portions of abomasum or intestine would have had no useful result. The bacteria present on the surfaces would in all probability have killed the experimental animal or produced a serious local lesion, but so would probably the injection of similar material from a normal sheep.

2. Although, as has been remarked, the indications are that the cause of Black disease is probably bacterial, this has not caused one to shut one's eyes to other possible causes. The next possibility—the one held by the majority of stock-owners concerned—is plant poisons. During the whole period of field investigations I have endeavoured to find plants which were common to the various localities in which the disease had occurred, and also what plants had been eaten in these areas.

A number of plants were fed to sheep and other animals, not because they were suspected to be harmful in every case, but because they had the common factors mentioned above. They were all proved to be innocent so far as Black disease is concerned.

In one district many stock-owners firmly hold the view that the common watercress, which grows abundantly in the small watercourses, is the cause of the trouble. In order to definitely settle the question, six sheep were fed for a fortnight upon fresh watercress. The result was negative. One is quite prepared to admit, however, that the watercress hypothesis may be an instance of correct observations, but wrong deductions—*i.e.*, the cause of the disease may be present more particularly in the wet situations where watercress grows so abundantly. The field observations and the various experiments indicate that Black disease is not due to plant poisoning.

3. A third theory is put forward by a worker on Black disease, viz., that the condition is a deprivation or a deficiency disease—*i.e.*, a condition due to the absence of a vitamine in the food, it being considered that the lesions resemble those of " wet " beri-beri in the human being.

At present this hypothesis appears to have been arrived at, not from any direct evidence, but mainly because a tangible cause has not yet been demonstrated. It is not wise nowadays to dismiss any hypothesis because it is strange or does not fit in with one's own views, but there are factors in connection with Black disease which, although ignored in the " deprivation " theory, need to be explained away if the latter is to receive more than academic attention. Some of these factors are the following :—

(*a*) Various animals graze continually over the same country, and in some instances in paddocks where sheep are dying, but only sheep are affected.

(*b*) Similar country, both in its physical geography and its geology, exists in other parts of the State, but Black disease has not been reported in those places already mentioned.

(*c*) What appears to be the seasonal character of the condition ; a few isolated cases may occur throughout the year, but the heavy mortality occurs at one particular period, and it appears to cease abruptly soon after the onset of frost. Often there is plenty of feed, and that of good quality.

(*d*) The erratic nature of the incidence of the disease. Adjoining paddocks may be only separated by artificial divisions. In one the losses may be heavy, whilst in the other the mortality may be nil or very light.

(*e*) The considerable annual variations in the incidence of the disease. During the season 1915, losses were very heavy. This, as I have suggested elsewhere, may be partly due to drought conditions ; but in 1916 (a good season for feed) they were again heavy, although not so great as in the preceding season. On the other hand, during the past season, 1917, when losses from parasitic troubles were heavy in sheep, the disease has been practically non-existent. Even on sheep stations where the annual loss often runs into four figures, the owners have informed me that this year their losses from Black disease have been negligible, only occasional sheep dying from this condition. During January, 1917, I spent my vacation visiting various sheep stations in a Black disease district, where the annual losses are usually considerable, in order that I might arrange for immediate investigation as soon as the disease commenced that season. In the cases where the owners have corresponded they have informed me that this season the losses were so sporadic that they could not be certain that I would be able to find cases on my arrival at the place, the district being several hundred miles from Sydney.

(*f*) There is no loss of condition in sheep dead of Black disease. In every undoubted case coming under my own observation, the condition of the animal has been good, or even fat. Such also is the experience of sheep-owners.

It is true that one or several of these objections to the acceptation of the deprivation theory could be explained away, but it appears to be difficult to meet the majority of them satisfactorily.

Is Black Disease identical with the Braxy-like disease of Sheep in Tasmania and Victoria, and with Braxy or Bradsot in Europe?

At first sight the answer to the above question appears simple. In Black disease, up to the present, no bacterium has been shown to be present with sufficient constancy in animals immediately after death has taken place to permit of one assigning to it any rôle in the causation of the disease. As a matter of fact, it has been the rule under such conditions to be able to demons rate no organism at all, whereas with the other diseases a bacillus has been readily isolated and considered to be the causal organism. If, however, one considers the matter more carefully, it will be recognised that the question is not so easy of disposal, and it is proposed to indicate briefly where the difficulty lies. In the first instance, in comparing the clinical characters and morbid anatomy of Black disease with the Braxy-like disease in Victoria, and with Braxy or Bradsot in Europe, there is reason to think that the various diseases are, if not identical, then varieties of the same disease; although, it must be remembered, some workers on Bradsot have expressed the view that there are several diseases of the sheep having common clinical features and similar post-mortem appearances, but which at present are grouped together under the name of Bradsot.

In comparing the various conditions mentioned, the first to be considered is naturally that occurring in a neighbouring State, viz., Victoria. Gilruth has gone very fully into the etiology of this disease, and as the result of his researches isolated a Braxy-like bacillus which he considers to be the cause of the condition investigated by him. Later on he concluded that the sheep disease in Victoria is but a variety of that of Braxy or Bradsot of Europe, and also probably identical with that known as Black disease in New South Wales. Taking all the circumstances into consideration, viz., nature of country, seasonal occurrence, ill-marked symptoms, rapidity of death, morbid anatomy, &c., there is every probability of the two diseases being identical, in spite of the fact that in the Victorian condition a bacillus has been definitely assigned as the cause and that a good deal of experimental work has been performed to substantiate the rôle assigned to that organism. It will be conceded that the same argument can be applied here, as in my own case with Black disease. In the latter condition it was shown that in the early part of the investigations sheep were not seen alive, but certainly very soon after they had died. Various experiments, in vivo and in vitro, were performed with material taken from them; and if one had been satisfied that the bacillus isolated from such cases was the cause of Black disease, it would have been additional confirmation of Gilruth's conclusions, but, as has been seen, subsequent work failed to substantiate the early findings.

In perusing the account of Gilruth's researches, it has become apparent that the rôle of the bacillus he regards as the cause of the disease in Victoria has not been completely established, seeing that the series of experiments conducted was built up with an anaerobic organism obtained from animals found dead. It has not been proved that this organism was constantly present in the body (speaking in the stricter sense) before death.

Under the circumstances it is not unreasonable to suggest that further research is needed upon the Victorian disease, before it can be considered as conclusively proved that the Braxy-type of bacillus in question is the cause of that disease.

In the case of European Braxy or Bradsot, it does not appear to be universally accepted that the so-called Braxy or Bradsot bacillus is the cause of that condition. I have also been given to understand that further research work is in progress in Scotland to elucidate the matter as regards the disease in that country. The bacteriological conclusions of workers in Scotland and Ireland appear to be based upon more unsatisfactory evidence than elsewhere. The bacteriological findings of the British Departmental Commission upon Braxy appear to be largely discounted now. It was not shown that Hamilton was not working with one or more of the so-called cadaver bacilli. From what I can gather, the work in Ireland upon Braxy is or was based upon the findings of the above Commission, and the same remarks may be applied, *i.e.*, it has not been proved that their organism is not a cadaver bacillus. Indeed, Mellon's description of the morbid anatomy of the disease in Ireland contains a good deal of what are post-mortem phenomena.

Concerning the disease on the Continent of Europe, controversy is still going on as to the rôle played by the so-called Bradsot bacillus, some maintaining that it is not the cause of Bradsot, but merely a post-mortem or agonal invader, others maintaining that all the proof necessary has been furnished that this bacillus is the cause of the disease.

In going through such literature upon this subject as is available to me here, it would appear that the advocates of the Bradsot bacillus have not yet shown convincingly that this organism is invariably present in the tissues or body fluids of an animal affected with Bradsot before or at the time of death. The fact that an organism may be found occasionally within the body before post-mortem invasion can have occurred is not altogether sufficient, *vide* remarks as to a similar occurrence in Black disease. Nor is the fact that one may at times merely demonstrate microscopically in sections of a certain organ removed directly after death, by a bacillus which is there in numbers, and apparently the sole organism present in the lesion, the only piece of evidence necessary that such is the causal organism of the disease under investigation. An instance of this is seen in the examination of some necrotic foci in the liver of animals dead of Black disease.

Finally, it may be stated that it is quite probable the disease of sheep in New South Wales known as Black disease is identical with or is a variety of the Braxy-like disease in Victoria, and with Bradsot or Braxy in Europe; but until the rôle of the Bradsot or Braxy bacillus is established upon a more unassailable footing, no definite conclusion one way or the other can be arrived at.

With regard to McCowan's claim that the primary cause of Braxy in Scotland is the *bacillus bipolaris septicus ovium*, I have not seen the original article, and no comment is made here except to say that no bacilli having the morphology of the hæmorrhagic septicæmia group have been detected in cases of Black disease.

BRACKEN POISONING IN CATTLE.

A CORRESPONDENT writes:—Your article in the October *Gazette*, from the Journal of the Board of Agriculture, England, "Bracken Poisoning in Cattle," was to me very interesting, and, I may add, illuminating. I have a small cattle run on the Hawkesbury River, and my cattle have from time to time been dying—a few every season. Some acquire the "disease" but recover, and get apparently quite well again. The cattle are generally most healthy and the country is healthy, with water supply second to no place in New South Wales. The "disease" generally came on when the pastures were dry and scarce, but there is always plenty of bracken about, and at times the stock eat it freely, especially the soft green fronds of some varieties. The whole thing was a puzzle to me, but I am now convinced that bracken eating is the key to the mystery. I am sure some cattle eat it so judiciously that it does them little or no harm; some become immune; and some get back on the pastures in time and recover. It is only those who go in largely and constantly for bracken eating that really come to harm. Unfortunately I have a large supply of bracken on my property; but now that I know the risk of leaving stock on it I will see that they are periodically put on pastures where there is none of it.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1917-18.

Northern Districts.

R. W. McDIARMID, Inspector of Agriculture.

DURING the season 1917-18 the potato experiments were conducted in conjunction with the following farmers:—

J. F. Chick, "Hill View," Tenterfield.
T. Farlow, "Mayfield," Red Range.
Wm. Moore, senr., Guyra.
Jas. Piper, jun., Llangothlin.
L. M. Rixon, "Mahemorilake," Uralla.
W. Lowry, "Strathmore," Quirindi.

The experiments comprised variety and manurial trials, and were sown along uniform lines at each place. The plots generally averaged one acre in area.

The Season.

The season was not suitable for potatoes, as a whole, and light returns were far more general than heavy ones. The spring months were wet, with few sunny days. The summer months were also very wet, with almost a total absence of warm days; while throughout the greater portion of the district the autumn months were too dry. These conditions were responsible for a great loss in the district, through seed rotting in the ground before germination, and in the case of early potatoes much being washed away. The sowings also were later than is desirable for the district, and consequently the yields were reduced. At Red Range the plots were planted under favourable soil and weather conditions, but excessive rains followed the day after completion, and the whole of the crop failed. A similar experience happened at Llangothlin; while at Quirindi the potatoes rotted in the ground before they could be harvested. The most favoured plots were those at Tenterfield and Uralla.

The Soil and Cultivation.

Tenterfield.—The soil here was the light granite loam typical of the district. The land was cropped to wheat the previous year, the stubble being turned under in July, after stock had been grazing thereon. This was harrowed in October and again ploughed, this time across the first ploughing. The potatoes were ploughed in on 30th October. The seed-bed was in good mechanical condition, and germination was good almost throughout all plots. The Dalhousie and Early Manistee varieties contained more misses than any others. In the variety trial the plots were fertilised with superphosphate at the rate of 2 cwt. per acre. The seed was mostly whole potatoes, dropped 16 inches apart in rows 3 feet apart, and covered about 4 inches deep. The rainfall during the following months was as follows:—November, 681 points; December, 432 points; January, 436 points; February, 166 points; March, nil. Total, 17·15 inches.

Red Range.—The plots were planted on the main road from Glen Innes in soil typical of that locality. It was cropped to maize in 1914, which was grown without artificial fertiliser. The following years, 1915–16 and 1916–17, the land was fallowed. During fallowing it was ploughed and cultivated often, and just prior to planting it was well cultivated to destroy all weed seeds. The sowing took place on 2nd November in a similar manner to that at Tenterfield. Immediately after sowing heavy rain commenced and continued for nearly two weeks, destroying all the seed.

Guyra.—The land selected here was typical of the district. It was cropped to potatoes the previous year, without fertiliser. It was ploughed twice, and harrowed immediately after the removal of the previous crop. The plots were ploughed in, the land being in splendid order, but the sowing was too late in the season for the best and safest crops. Sowing took place on 13th December, which is from six to eight weeks too late for the district. A large amount of the seed perished before sowing, and more died after it had been planted. This necessitated small plots, and as germination was not even the results are not strictly comparable. The variety trial only was planted. The rainfall was not recorded near these plots, but it was excessive in December and January, and deficient later in the growing season.

Llangothlin.—The land here is typical of the district, and similar to that at Guyra. It was a rich red volcanic soil, highly suitable for potato culture. It was cropped to potatoes in 1916, without fertiliser. Ploughing was done in August, and again in October. The potatoes were ploughed in on 10th December, the rows being 32 inches apart, and the sets 20 inches apart in the rows. The seed had deteriorated considerably before planting, and with heavy rains immediately after planting a very thin crop resulted. The crop was so irregular from faulty seed and poor germination that the plots were not separated at harvesting. The rainfall was not recorded in the immediate vicinity of these plots.

Uralla.—The land utilised for the plots at Uralla had been under cultivation for some years. The previous crop was oats (without fertiliser), which had been harvested for hay. The stubble land was ploughed in July and harrowed; ploughed again in August, and harrowed in September, and again in October; cultivated twice, and harrowed and rolled a few days prior to sowing. The potatoes were ploughed in on 20th October, with the single furrow plough, and the whole was harrowed on completion. The strike was good, and the subsequent growth good until the autumn months; then the weather was rather too dry, and the crops consequently suffered in yield. The rainfall recorded at the plots was as follows:—November, 822 points; December, 329 points; January, 545 points; February, 125 points; March, 23 points. Total, 18·39 inches.

Quirindi.—A variety trial only was conducted here, the land being a rich alluvial creek-flat soil, that had been many years under cultivation. The previous crop was wheat, which was grown without fertiliser, and cut for hay. The stubble was ploughed under in July, and the land harrowed, and again ploughed at planting time in September. The potatoes were planted on 17th September by ploughing in, in drills 3 feet apart, and the sets 18 inches apart in the drills. The crop was practically ruined by the heavy and continuous rains following the sowing, and only those on the higher land were harvested. The rainfall in the vicinity of these plots was not recorded, but it was in excess of requirements.

TABLE A.—Showing the Results of Variety Trials with Potatoes, Northern Districts.

Variety.	Tenterfield.				Guyra.*				Uralla				Quirindi.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Queen of the Valley..	4	8	3	0	1	3	3	22	1	7	3	12	......			
Surprise	4	0	2	14	1	9	0	8	1	10	3	6	.. ...			
Manhattan	3	15	0	0	1	0	2	14	1	13	3	20	7	0	0	0
Satisfaction	3	7	2	0	... ..				......				......			
Carman No. 1 ...	2	15	0	0	0	5	0	12	1	0	0	0	Failed.			
Early Manistee ...	1	17	2	0	0	6	2	12	0	14	1	14	,,			
Dalhousie	1	17	2	0	1	1	3	19	1	4	3	8	......			
Blue Imperial ...	1	13	3	0	0	6	2	20	......				......			
Rector	1	10	0	0	......				......				......			
Mac	Nil.				......				......				......			
White City	1	2	2	0	......				......				.. ...			
Windsor Castle ...	Nil.				......				......				.....			
S 1	1	13	3	0	.. ...				.....				.... .			
Dalmeny Hero ...	1	13	3	0	......				......				......			
Coronation	......				2	15	1	14	1	16	1	0	... ..			
Sussex	......				......				1	8	3	20	......			
Factor	......				......				......				Failed.			

* Results at Guyra are not comparable owing to the very patchy germination.

All varieties in the above trials were fertilised with 2 cwt. superphosphate per acre, excepting Sussex at Uralla, which was grown without any fertiliser.

TABLE B.—Showing Results of Manurial Trials, Northern Districts.

Variety—Queen of the Valley.

Manure per acre.	Tenterfield.				Red Range.	Llangothlin.	Guyra.	Uralla.			
	t.	c.	q.	lb.				t.	c.	q.	lb.
2 cwt. Superphosphate..	4	8	3	0	Failed.	Failed.	Failed.	1	7	3	12
2½ cwt. P5 mixture ...	4	7	2	0	,,	,,	,,	2	0	3	6
3 cwt. P7 ,, ...	4	9	1	14	,,	.,	,,	1	11	2	12
No manure	4	2	2	0	,,	,,	,,	1	4	2	26

P5 Mixture consists of 16 cwt. superphosphate and 4 cwt. sulphate of potash.
P7 Mixture consists of 10 cwt. superphosphate and 10 cwt. bone-dust.

TABLE C.—Showing Proportion of Marketable to "Seed" Potatoes at Uralla.

Variety.	Marketable.			Seed.	
	c.	q.	lb.	q.	lb.
Queen of the Valley	2	1	14	1	18
Sussex	2	1	0	2	16
Coronation	3	0	0	2	14
Manhattan	2	3	0	2	16
Dalhousie	2	0	11	1	9
Early Manistee	1	0	9	1	11
Carman No. 1	1	2	26	1	2

Conclusions.

The season was so abnormal, and conditions so unfavourable almost throughout the North, that conclusions cannot be drawn from the results obtained. The same varieties have, however, been placed at the top of the list for yield as in the past, and the value of fertilisers for potatoes is again demonstrated at Tenterfield and Uralla, though not in such a marked degree as in former years, under more favourable and average conditions.

Western District.

J. E. SYME, Assistant Inspector of Agriculture.

THESE experiments were carried out on the farms of—

D. Noonan, "Garryowen," Millthorpe.
B. C. Meek, Hobby's Yards.
W. Burns, "Goongawarrie," Carcoar.
G. W. Kelley, Oberon.

The Soil and Cultivation.

Millthorpe.—The land used in these experiments was a red basaltic soil, ploughed about 5 inches deep on 1st October, and harrowed, ploughed again in November, after which heavy rains set the ground hard. The potatoes were planted on the 18th of December in rows 2 feet 6 inches apart, the seed being dropped every 2 feet. Superphosphate at the rate of ½ cwt. to the acre was used in the variety trials. After planting the land was allowed to lie in the furrows until January, to prevent the rain setting the soil before the potatoes were up. It was then harrowed.

Hobby's Yards.—The land employed in this case was a heavy volcanic loam, rather low-lying, and inclined to be wet. It was virgin land ploughed 6 inches deep with a three-furrow plough in May, harrowed in August and ploughed in September, harrowed again in October, and cultivated twice. The potatoes were planted in rows on 29th November, 2 feet 6 inches apart, seed being dropped every 2 feet. The land was harrowed immediately after planting, again when well above the ground, on 29th December, and then again towards the end of January and hilled in February. The crop was dug on the 1st of May. The rainfall during the growing period was 10·36 inches.

Carcoar.—The land in this case was of granitic origin, grey in colour, and was planted on 4th December. The previous crop was oats, which had been manured. The potatoes were planted in rows 2½ feet apart and every 18 inches in the rows. Three cwt. superphosphate per acre was used in the variety trials. When half of the potatoes had been planted rain fell, and the remainder had to be planted afterwards. The higher yields are from those planted before the rain. The rainfall during the growing period was 11·33 inches. Coronation were unfortunately mixed with the check rows in the digging, but were estimated to yield 4½ tons to the acre. In the manurial trials P7 mixture gave the best results by 7½ cwt.

Oberon.—The soil—a red loam—was ploughed about 6 inches deep on the 23rd August and allowed to lie until 26th October, when it was cross-ploughed and harrowed, being then in very good order. It was planted on the 7th and 8th December, the seed being dropped 18 inches apart in rows 2½ feet apart. It was scuffled twice to keep down the weeds, and hilled.

TABLE showing Results of Potato Variety Trials, Western District,

Varieties.	Millthorpe.*				Hobby's Yards.†				Carcoar.†				Oberon.†			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Queen of the Valley ...	1	10	3	21	0	18	3	0	2	5	2	8	3	19	3	5
Up-to-Date	1	10	3	21	....				1	19	2	8	....			
Manhattan	2	1	1	0	1	10	1	22	4	10	1	12	6	16	1	17
Carman No. 1	2	11	2	7	1	9	2	6	3	16	2	12	5	10	0	0
Sussex	3	3	1	0	....				3	18	2	8	....			
Early Manistee	2	19	0	14	1	2	0	12	3	13	3	12	2	2	3	17
Surprise	1	15	3	0	....				1	10	2	16	6	3	0	0
Coronation	2	18	3	20	....				4	10	0	0	....			
Factor	5	8	3	0	1	16	3	4	5	5	1	6	5	12	3	0
Blue Imperial	2	18	1	21	1	18	1	16	....				....			
S 1	2	8	0	14	0	18	1	16	3	0	0	12	2	19	1	17
98 x-bred...	2	8	3	26	....				....				....			
Acquisition	1	17	0	14	....				....				... .			
Langworthy	1	10	3	21	0	8	0	4	....				....			
Windsor Castle	2	11	2	7	....				....				....			
Dalhousie	0	15	1	25	1	4	0	2	....				....			
Dalmeny Hero	....				0	12	0	16	....				....			
Lansdown	....				1	0	0	0	....				....			

* ½ cwt. Superphosphate per acre. † 3 cwt. Superphosphate per acre.

TABLE showing Results of Potato Manurial Trials, Western District.

Manure and Amount per acre.	Millthorpe.				Hobby's Yards.				Carcoar.				Oberon.			
	t.	c.	q.	lb.	t.	c	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
No manure	1	8	3	14	1	0	3	16	1	0	1	20	3	10	1	17
3 cwt. P7 mixture ...	....				0	18	2	8	2	13	0	4	4	3	2	10
2½ cwt P5 mixture ...	....				1	8	2	0	1	13	1	6	3	14	3	5
3 cwt. Superphosphate...	....				0	18	3	0	2	5	2	8	3	19	3	5
1 cwt. P7 mixture ...	1	10	3	21	....				....				....			
1 cwt. P5 mixture ...	1	17	3	7	....				....				....			
½ cwt. Superphosphate...	1	14	1	14	....				....				....			

Queen of the Valley was the variety used in each case.

Southern Tablelands.

R. N. MAKIN, Inspector of Agriculture.

The following farmers co-operated with the Department in conducting the potato experiments on the Southern Tablelands during the past season :—

O. E. Silk, "Woodbine," Nimmitabel.
Boys and Pinn, Crookwell.
Cunningham Bros., "Redbank," McAlister.
J. Plumb, Cotta Walla, Crookwell.
The Superintendent, Industrial Boys' Homes, Mittagong.
J. White, Moss Vale.

The Moss Vale and Mittagong plots were sown during October, the ground being rather moist at the time. The season proved to be too wet for both of the plots, the crops being lost on account of wet rot manifesting itself. The Nimmitabel and Crookwell district plots were all sown during November. At Nimmitabel fine weather was experienced during the sowing, and the ground was in good order, but wet weather was met with throughout the planting in the Crookwell district.

Germination was good on all the plots, except in the case of Mr. Plumb's plot, where the sowing was late and the seed potatoes had practically exhausted themselves by sprouting—the sprouts having been removed several times before planting. Had the seed not been so forward much better results would have been forthcoming, perhaps, as the local seed used in the farmers' variety test gave splendid returns. It was a circumstance which could not be obviated at the time. Potatoes to be planted late in the season on the Tablelands should be kept there throughout the winter so as to retard them.

The season was rather wet. In January heavy rain fell, and showers kept the ground wet right up to the end of the harvest; indeed, it was difficult to dig the potatoes as the ground was so wet. A quantity of potatoes on being lifted were found to be badly infected with Irish Blight and Wet Rot. Manhattan suffered most, whilst Early Manistee and Magnum Bonum were most resistant.

Planting was carried out by dropping by hand in furrows about 2 feet 9 inches apart, sets about 2 oz. in weight, 18 inches apart in the furrows, and covering with the plough, except in the case of Messrs. Boys and Pinn's plot, where the sowing was done with a machine.

Of seed, 12 cwt. was allowed per acre, and all varieties were treated with 2 cwt. per acre of superphosphate, dusted along the drills.

In all cases the soil was typical potato land, chiefly red in colour and of basaltic formation; portion of the Nimmitabel plot was on black soil, where perhaps the crop was better than on the higher ground, which was red.

Weed growth was kept in check whenever weather conditions would permit. Fat hen, one of the worst weeds to be dealt with, had to be hand-pulled in many cases. This weed is a great pest on the Tablelands, and a more aggressive attitude towards it might well be adopted by farmers.

TABLE A.—Showing Results of Variety Trial, Southern Tablelands.

Variety.	Nimmitabel.				Crookwell (Boys and Pinn).				McAlister.				Crookwell (J. Plumb).			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Queen of the Valley	8	0	0	0	3	8	3	0	4	1	2	22	3	1	3	8
Carman No 1	5	12	2	0	4	3	0	0	4	9	2	26	2	13	2	19
Early Manistee	4	2	2	0	2	0	0	0	5	5	2	4	3	8	0	19
Manhattan	5	5	0	0	2	11	1	0	5	1	3	4	4	10	0	14
Satisfaction	4	13	1	0	2	12	0	0	4	3	2	8	1	14	2	18
Up-to-Date	4	2	2	0	4	0	0	0	....				... .			
Surprise	4	2	2	0	2	17	2	0	....				....			
Coronation	6	15	0	0	3	10	0	0	....				....			
Dalhousie	4	10	0	0	6	10	0	0	....				....			
Factor	7	10	0	0	2	0	0	0	....				....			
Langworthy	4	0	0	0	2	8	0	0	....				....			

A manurial test was conducted at each centre. Superphosphate by itself, superphosphate and bone-dust mixed together in equal quantities (P7), and superphosphate, four parts, mixed with sulphate of potash one part (P5) were under test against an unmanured section. The mixtures in most cases showed satisfactory returns.

TABLE B.—Showing Results of Manurial Trial, Southern Tablelands.

Manure.	Nimmitabel.				Crookwell (Boys and Pinn).				McAlister.				Crookwell. (J. Plumb).			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate, 2 cwt. per acre.	8	0	0	0	3	8	3	0	4	1	2	22	3	1	3	8
P5 mixture, 2½ cwt. per acre	8	16	0	0	5	4	0	0	4	18	2	8	3	9	1	9
P7 mixture, 3 ,, ,,	3	5	0	0	4	19	0	0	4	15	1	12	3	10	1	26
No manure	4	15	0	0	3	13	3	0	3	6	3	24	1	15	3	7

Of the varieties, the largest tubers were obtained from Manhattan, but, as before stated, the losses from disease were greatest in this variety, and chiefly on account of this trouble growers will probably shortly discard it. The same is likely to be done with Surprise, Satisfaction, and Queen of the Valley. Surprise and Satisfaction, when grown to any size, invariably exhibit hollows in the centre. Surprise is a bad keeper, and Queen of the Valley and Satisfaction are notorious for Brown Fleck. Early Manistee will be grown on a larger scale when seed becomes more plentiful. It is undoubtedly the best cooking potato that has yet been grown on the Department's plots on the Southern Tablelands. It is not a big cropper, but it can be profitably grown. Coronation is very popular in some parts, and sells well on the market; it yields satisfactorily, but a great many of the potatoes are on the small side. Carman No. 1 is an excellent variety, and is now being largely grown; it is not so hardy as Up-to-Date, but it is not so likely to make second growth as that variety. Dalhousie, Factor, and Langworthy are white-skinned varieties, of which more will be heard later on; Dalhousie is the most promising of the three.

At Crookwell, on Mr. J. Plumb's farm, the plot was run under the auspices of the Cotta Walla branch of the Agricultural Bureau, and interest was added by members of the branch bringing varieties of potatoes of their own growing and selection, and competing with those sown by the Department under the same conditions, except that the Departmental seed had the disadvantage that it had sprouted too much before planting. The yields from the farmers' varieties, which were excellent, are appended :—

Farmer.	Variety.	Yield per acre.			
		t.	c.	q.	lb.
J. C. Weatherspoon	Magnum Bonum	8	18	2	12
A. Rowe	,, ,,	8	18	2	3
J. Kadwell	Commonwealth	8	15	0	0
W. D. Rumble	Carman No. 1	8	2	0	20
P. Willis	Coronation	7	9	0	6
G. Butt	Early Brownell	7	8	0	15
T. A. Howard	Brownell's Beauty	7	2	0	13
J. Wray	Up-to-Date	6	12	0	21
T. J. Kennedy	Manhattan	5	17	0	23
O. H. Storrier	Surprise	5	15	2	5
J. Plumb	Bliss' Triumph	4	14	2	27

The yield of Departmental varieties will be seen in the main table.

The work that is being done by this branch of the Bureau is of considerable value to the farmers of the district, and experiments such as these are worthy of encouragement. Owing to the areas on which the experiments were conducted being large—in many cases half-acre blocks of each variety—the harvesting is a big undertaking. To meet this difficulty the Department purchased a potato digger for the work. It was first tried at Nimmitabel, where it did excellent work. Late in the season it was forwarded to Crookwell, but owing to the wet state of the ground and the season being practically over, it awaits a test in the coming season.

SUBSOILING WITH EXPLOSIVES.

DURING the past few years the Department has conducted several experiments and demonstrations in the use of explosives for subsoiling, but as a result it cannot be said that this method has any marked advantage over any other. The effects of subsoiling by this method are not by any means of a lasting character, and to ensure satisfactory results the operation becomes necessary every few years, as broken-up subsoils show a tendency to resolidify after a time.

The spacing of the charges, as determined by the average shattering effect of a subsoiling charge, would appear to be 5 feet each way, and when this is calculated out upon an acre basis, with the cost of the various items required —gelignite, detonators, and fuse, and the labour involved in preparing the charges, boring holes, tamping and firing the charges—the total cost becomes prohibitive, even if the results of the work are satisfactory as far as succeeding crops are concerned.

Under the circumstances, subsoiling by explosives is not an operation which can be recommended in a general way by the Department.

Castor Oil.

H. ROSS, Chief Inspector of Agriculture.

The heavy demand for castor oil, principally for lubricating purposes, that has set in during the last few years, has led farmers in various parts of the State to make inquiries regarding the possible cultivation of the castor oil plant on a commercial scale.

Indigenous to Northern Africa and India, the plant (*Ricinus communis*) has spread to all parts of the world possessing tropical and sub-tropical climates. Its introduction into Australia is due more to the fact that it has been grown here for years past as an ornamental shrub rather than as a commercial crop; in fact, no records are available to show that the castor oil plant has at any time been cultivated in New South Wales with a view to producing beans and extracting the oil. Perhaps there is a good reason for this when we take into consideration present labour conditions.

Where Grown.

Castor beans are largely grown in India, the United States of America, Java, and Brazil—England, France, Germany, and Belgium depending upon these countries for the supply of the beans.

India has, in the past, produced more of the beans than any other country in the world, and the whole of Europe practically depends upon that country for its supply. Mills for the extraction of the oil are in existence throughout Europe.

Quoting statistics supplied by Charles M. Dougherty, of the Bureau of Crop Estimates, United States Department of Agriculture, it appears that India has enjoyed practically a world monopoly in this crop. Besides producing more oil than any other country, it is estimated that India exported between 3,000,000 and 5,000,000 bushels of beans annually.

As far as Australia is concerned, it appears that not much attention has been given to the importation of the beans and subsequent extraction of the oil; the oil itself is imported.

The quantities of castor seed exported from India to the principal consuming countries during the five years for which figures are available have been as follows*:—

Exports of Castor Seed from India to—	1904-5.	1905-6.	1906-7.	1907-8.	1908-9.
	cwt.	cwt.	cwt.	cwt.	cwt.
United Kingdom	452,358	479,348	649,874	1,121,035	806,789
France	266,845	286,848	277,002	267,383	333,959
Belgium	275,179	185,568	198,785	289,733	207,093
Italy	252,010	197,249	166,268	237,028	176,223
Germany	193,402	136,757	203,691	70,499	109,603
Total Exports	1,460,908	1,298,624	1,505,059	1,993,717	1,650,466

* Bulletin of the Imperial Institute, 1911.

The quantities of castor oil exported for the same period have been as follows :—

Exports of Castor Oil from India to –	1904–5.	1905–6.	1906–7.	1907–8.	1908–9.
	gals.	gals.	gals.	gals.	gals.
United Kingdom	256,975	191,034	129,102	233,583	131,308
Ceylon	72,041	61,994	65,818	81,233	63,980
Straits Settlements	242,672	201,169	185,019	186,686	176,824
Hongkong	102,524	68,392	33,737	18,268	13,533
Cape Colony	110,344	92,070	172,802	81,495	9,069
Natal	212,269	255,528	231,358	215,137	73,690
Mauritius and Dependencies ...	92,582	105,867	96,602	92,415	82,414
New Zealand	89,841	111,748	132,380	129,640	166,718
Australian Commonwealth ...	428,520	293,677	363,723	439,445	352,841
†Other Foreign Countries ...	14,342	45,837	21,921	23,114	23,275
Total Exports	1,632,106	1,432,108	1,455,636	1,508,545	1,099,967

† Principally Siam, Portuguese East Africa, Japan, and Dutch Guiana.

Is Castor Bean Production Payable?

To answer this question it has to be borne in mind that countries in which cheap labour is available are the principal producers ; therefore, the question of exporting our surplus crop is one which cannot be regarded seriously, and to satisfy the local demand must be the one aim of the would-be producer.

The following questions naturally present themselves :—

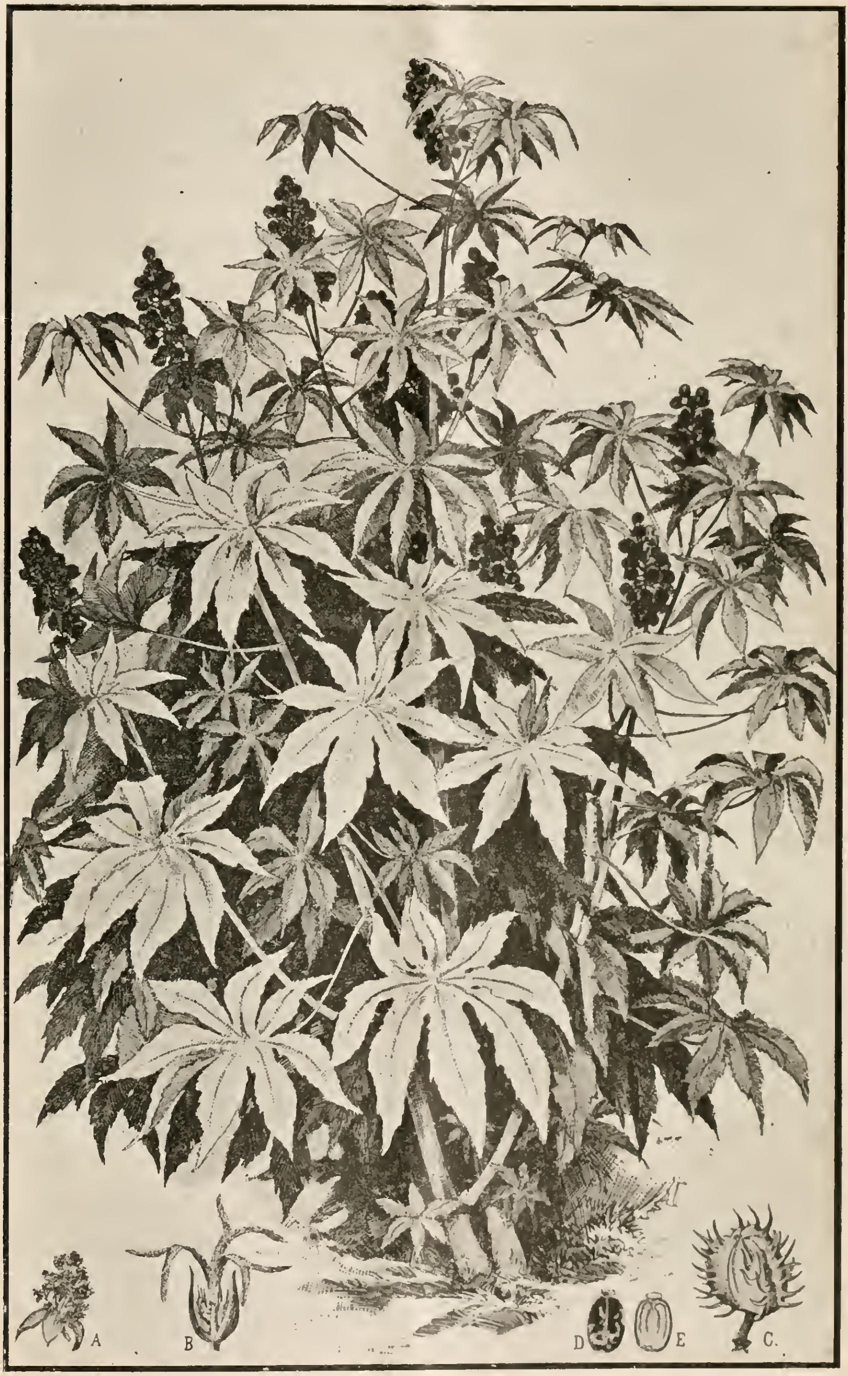
1. What is the demand for castor beans ?
2. How many bushels per acre is a fair yield ?
3. What is the probable price per bushel ?
4. What is the cost of production, including rent of land, seed cultivation, harvesting and marketing ?

The answers are :—

1. The demand is a limited one ; assuming 100,000 gallons to be sufficient for New South Wales requirements, about 3,500 acres under this crop will supply this demand.
2. Not more than 20 bushels per acre can be expected, although yields of 30 and even 40 bushels per acre are recorded from Florida, South Carolina, Georgia, Texas, and California.

   The Queensland Department of Agriculture, in the July issue of the *Queensland Agricultural Journal*, states that the average yield is about 20 bushels per acre.
3. The price per bushel can hardly be estimated, in so far that no market has been established in the past for beans in Australia.

   The War Department at Washington, U.S.A., has let contracts for the supply of beans at 3·50 dollars (approximately 14s.) per bushel of 46 lb. This, it must be remembered, is during war time, when an unprecedented demand has set in for castor oil for aeroplanes, and it is not likely that these prices can be maintained.



The Castor Oil Plant (*Ricinus communis*).

A. Male flower. B. Female flower. C. Capsule. D. Seed. E. Longitudinal section of seed.

Quoting from an article in the *Country Gentleman* (U.S.A.) for March, 1918, contributed by E. B. Reid, it is stated that "in recent times prices to farmers have fluctuated widely by localities and years, ranging from one to two dollars a bushel, with possibly one dollar to one dollar and a quarter about the average."

Further evidence is available as to price in an article on castor seed published in the "Bulletin of the Imperial Institute," 1911. The writer states that specimens were submitted to commercial experts, who valued them as follows:—

	£	s.	d.	
Nos. 1, 3, 4, 6 ...	9	17	6	per ton, March, 1909.
„ 5, 7	9	10	0	„ „
„ 2	9	0	0	„ „
„ 8	8	10	0	„ „
„ 9	13	5	0	„ October, 1910.

net weight, including bags, delivered free *ex* ship Hull, less 2½ per cent. discount.

Taking the American and English figures as a guide, we see then that the price in 1909 was somewhere about 4s., and in 1910 in the vicinity of 5s. 4d. per bushel.

4. The cost of production can only be arrived at according to locality; it would be somewhat similar to the cost of producing an acre of maize except that the harvesting is much more expensive. This is accounted for by the fact that the pods do not ripen evenly and the crop has to be gone over several times in order to harvest it. An estimate for producing, harvesting, bagging, and marketing a 20 bushel crop of castor beans, allowing 10s. per annum for rent would not be less than £5 per acre.

From the above figures farmers will be able to draw their own conclusions as to whether this crop can be considered payable. Furthermore, it may be stated that castor oil plants cannot be grown continuously on the same land for any lengthy period, because the crop exhausts the soil rapidly; so much so that some authorities state that it should be grown only once in five or six years on the same land.

In India the castor bean is usually not grown as a pure crop, that is, it is not grown by itself, but is grown as a border to either a cotton or some other crop, being frequently mixed with a cereal or a legume crop.

The castor oil plant has been proclaimed a noxious weed in many shires and municipalities of this State, and before it can be cultivated in these districts the restriction would have to be removed.

Methods of Cultivation.

For the benefit of farmers who wish to try this crop the following information regarding cultivation, harvesting, &c., is given.

Climate.—A tropical or sub-tropical climate is best suited for the production of castor beans, the North Coast being particularly suitable.

Soil.—A good loamy soil such as is suited for maize-growing is best, although fair results may be obtained from poorer soils. Heavy clay soils, especially those which are wet and sour, are unsuitable.

Sowing.—The seed should be sown in spring when all danger of frost is over, on well prepared land, in hills, 6 to 7 feet apart in the rows, and from 6 to 8 feet apart between the rows. Three seeds are planted in each hill and covered to a depth of 2 to 3 inches. It is advisable to pour hot (not boiling) water over the seed prior to planting and let them steep for twenty-four hours.

Thinning out.—When the plants are from 6 to 8 inches high the two smaller ones should be removed from each hill, leaving the strongest.

Intertillage.—It is necessary to cultivate between the rows in order to keep down all weed growth. The intertillage should be similar to that given to a maize crop.

Pinching back.—If the plants are allowed to grow without check they will frequently attain a height of from 15 to 20 feet, thus making the harvesting of the seed very inconvenient. In order to keep the plants at a convenient height, the main stem should be pinched back.

Experiments are being conducted on the Grafton and Wollongbar Experiment Farms, also in several localities on the North Coast; and until the results from these experiments are to hand, farmers who wish to give this crop a trial are advised to do so only on a very small scale.

Percentage of Oil.

The "Bulletin of the Imperial Institute" (1911) gives the result of nine samples submitted for examination :—

No. of Sample.	Yield of Oil.	No. of Sample.	Yield of Oil.
	per cent.		per cent.
1	48·0	6	48·9
2	50·8	7	47·6
3	49·4	8	45·8
4	47·8	9	48·2
5	50·0		

A sample obtained from Queensland was analysed by the Chemist's branch of this Department, and Mr. Guthrie reports as follows :—

Husk	24·63 per cent.
Kernel	75·37 ,,

The yield of oil from the kernel was 55·41 per cent., corresponding to a yield of 41·76 per cent. of the whole bean.

The oil was obtained by extraction with sulphuric acid.

Harvesting Seed.

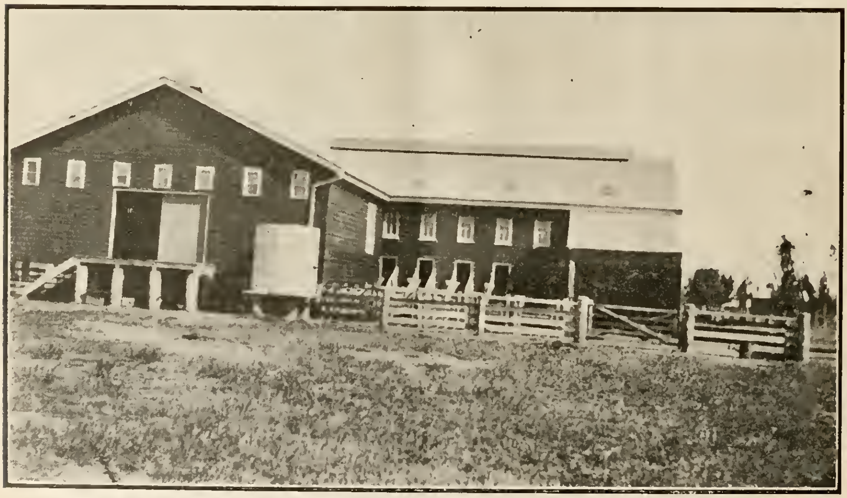
It is here where most of the difficulties in connection with this crop will be encountered. The seed does not all ripen at the same time. When nearly ripe the capsules begin to turn brown, and it is then that the "spikes" should be harvested. If left the seed shoots out of the capsule. The spikes ripen at irregular intervals, necessitating going over the crop several times before the seed is harvested. Cutting the spikes has to be done by hand; immediately they are cut they should be carted to the barn and spread out, preferably on a wooden or a hard-set earthen floor, surrounded by sides about 2 feet high; these sides may consist of either wood or bagging. The hot rays of the sun will greatly accelerate thorough ripening. They will need to be turned over with a fork at least once a day until thoroughly ripe, when the seeds will "pop" out. It is this popping of the seeds which necessitates the cut spikes being placed either in a shed or on a floor surrounded by an enclosure.

After the seeds are out of the capsules nothing further remains to be done except to separate the seeds from the husks by winnowing.

It usually takes from four to six days after cutting before the spikes shed their seed.

Sheep-yard Equipment at Trangie Experiment Farm.

Following on the plans and descriptions of the shearing sheds, drafting yards and dips (erected on some of the Departmental Experiment Farms) which were given in detail in the last issue of the *Agricultural Gazette*, the accompanying illustrations of the shearing shed at the Trangie Experiment Farm, from photographs supplied by Mr. A. H. E. McDonald, the Manager, will be found of interest.



General View of Shearing Shed, Trangie Experiment Farm, showing Loading Platform, &c.

Side View, showing Loading Race, Yards, &c.

A Closer View of the Yards.

SHEEP-YARD EQUIPMENT AT TRANGIE EXPERIMENT FARM.

Saccaline at Wollongbar Experiment Farm.

A. H. HAYWOOD, Manager.

THIS fine fodder plant was first introduced from Victoria to the Richmond River by Mr. Geo. Elliott, of Woodburn, not long ago. It then bore the misapplied name *Saccharum officinarum* (sugar-cane). Saccaline is not a sugar-cane at all, but is an approved strain of sweet sorghum, which seems to have developed a perennial habit. The name it now bears is a local one, and appears to be a corruption of the word saccharine.

The misnaming of this fodder has no doubt retarded its distribution, and it seems to be known only on the Richmond River. It is significant that when once grown in this district all the older and better known sorghums, such as Early Amber Cane and Planter's Friend, are discarded. It grows to a height of 12 feet, stools well, and each stem matures a seed head. The yield on average soils in this district is from 15 to 20 tons per acre. All stock are fond of it, while cattle and pigs can be kept in splendid condition when it is fed to them in quantity.

General View of Saccaline growing at Wollongbar Experiment Farm.

Saccaline has been grown at the Wollongbar Farm for the past two years, and is preferred to all other sorghums yet tried.

It is particularly valuable as a cleaning crop on old paspalum pastures after they are broken up. If sown broadcast in the warm weather the growth is rapid, and soon smothers all fresh paspalum growth. When sown broadcast 35 lb. of seed per acre is required, but if in drills about 5 lb. per acre is sufficient.

The following is the report by the Chemist of the Department of Agriculture in connection with the sample of Saccaline submitted for analysis as to its nutritive ratio:—

	Fodder as received.		Calculated to dry substance.	
	per cent.		per cent.	
Moisture		67·20		......
Albuminoids		1·52		4·64
Ether extract		0·50		1·52
Ash		1·14		3·47
Fibre		6·91		21·07
Carbohydrates—Cane sugar	5·00		15·26	
Fruit sugar	3·47		10·59	
Starch and other bodies	14·26		43·45	
		22·73		69·30
Total		100·00		100·00

Nutritive value ... ... 25·37 per cent.
Albuminoid ratio .. .. 1 to 16.

The sample for analysis was cut when out in head in July last from a crop that had been planted the previous February.

Saccaline may be propagated from cuttings, but this system is not recommended for growing on a commercial scale.

The chief features of Saccaline may be summarised as follows:—

1. Adaptability to coastal districts.
2. Sweetness and palatability.
3. Ratooning habit.
4. Suitability as a fodder for dairy cows.
5. Cleaning crop.

The ratooning habit of Saccaline is one of its most valuable characteristics, as after the first cutting it ratoons again, and successive good yields may be obtained. This applies particularly when it is planted in drills and intertillage is carried out. One grower here claims to have obtained nine cuttings from his crop of Saccaline.

Information is to hand that Saccaline was tried on the South Coast last season, and farmers were so satisfied with the results that an order was sent to this Farm for a ton of seed.

AUSTRALIAN-GROWN DRIED HERBS FOR CULINARY PURPOSES.

IN view of the questions often asked, as to the prospect of being able to grow the requirements of New South Wales within the State, the Department has ascertained from one of the firms handling the product that at the present time the price of the best qualities of herbs is as high as 1s. 9d. to 2s. 6d. per lb. These prices cannot last, and the general rate is from 10d. to 1s. 3d., according to kind and quality.

Close consideration would have to be given to the whole of the factors associated with the industry before embarking upon it on any extensive scale.

Poultry Notes.

DECEMBER.

JAMES HADLINGTON, Poultry Expert.

AT this season of the year it will be well to remember that the present cost of feeding a laying hen is, approximately, 7s. 6d. per annum, and that the highest point of egg production will have been past by the first of this month. From now onwards the average egg production per hen will steadily fall until next June, nor will the higher price that will rule as a consequence of the lowered volume of production altogether compensate for the decrease. The egg farmer will find that his returns in respect of the hens over twelve months old are getting lower each month, and that nothing he can do, in a general way, will alter this seasonal decrease. Apart from good management, the only way by which income and expenditure can be brought within reasonable relationship is at once to commence culling out the hens that have stopped laying, particularly hens that have completed their second year. Here, however, some discrimination is necessary in the case of valuable breeding stock which it may be desirable to keep for another season. A hen may have passed her profitable age as a layer, and yet be worth keeping on account of the class of progeny she may still be likely to produce. However, the main culling will be confined to flocks not regarded as breeding stock; among these there will be culled many poor producers, particularly if they include late or out-of-season-hatched stock.

Culling.

It is one thing to advise culling in the light of experience, but it is quite another for the novice who has not acquired the experience necessary to enable him to cull without over-culling in such a manner as to cause a loss of potential profit. Without taking into account expansion and contraction of pelvic bone measurement (which is not absolutely reliable for purposes of culling), the first visible sign of a hen having ceased to lay, and of an approaching break-up, is the colour and texture of the comb. When this has become shrivelled, withered, or stiff in contrast to the bright scarlet, expanded, pliable comb of a hen in full health, it is almost an infallible sign that the hen has ceased to lay. This condition is usually associated with a rigidity and closing of the pelvic bones. The point is that, if this condition happens during the months August to December, it would be an indication that something had gone wrong with the health of the hen, and, not infrequently, a timely teaspoonful of Epsom salts given twice during a week will bring about a better condition of health, and the hen may be brought on to lay again, but such improvement is not likely when the condition referred to supervenes at this time of the year—no matter what may have been the cause, whether from ill-health or the cessation of laying, it is almost certain to bring on the moult. Here again is where skilful feeding and management will materially assist in prolonging the laying period of hens. As has already been hinted, almost any hen will lay during certain months of the year; so also will many hens survive much unskilful treatment, and still continue to lay during those months; but it is during the remainder of the year—say, from November to July—that skill and experience are required to produce the best possible results in egg production. However, notwithstanding all the skilful treatment that can be given them, plus the good laying qualities of the flock as a whole, the poor layers will now begin to show themselves, and some culling may be necessary, even among first year hens. Birds completing their second year of laying will require to be marketed during the next few months as they go off laying. It is folly to attempt to carry them on into the winter with the hope that they will come on to lay again before the spring.

Consequences of Neglecting Broody Hens.

At this time of the year a good deal of the laying capacity of hens of the breeds that go broody is lost through neglect or the haphazard way in which they are treated, not alone from the time lost during which the fever is upon them, but from the fact that so many hens, perhaps otherwise potentially good layers, are allowed to keep to the nest too long, and become confirmed to broodiness. Many hens become broken in condition to such an extent as to induce a premature moult, when, as a rule, production ceases for some considerable time. If these birds that go into moult early came on to lay early, no loss would result; but, as a rule, they do not do so, and usually the services of these hens are lost from the time they go into moult until the following July, or perhaps August. Hence it is that the late moulter is usually the hen that has put up a big score, but these same hens if they had been badly managed under the conditions mentioned and become broken up, would have failed to put up big tallies. The object of the poultry farmer should, therefore, be to stave off broodiness at this time of the year by every possible means, and thus prolong the laying period. The way to do this is to have a proper system of dealing with broody hens as they take to the nest. The best system is to make a practice of removing all broodies from the nest either at or soon after the evening egg collection every day. It will, of course, happen that some eggs will be laid by the broodies after they are removed, but it is far preferable to put up with this than to let hens get too confirmed to the nest. It is, of course, understood that the average poultryman's fear of such eggs getting broken and eaten is one of the causes why many hens are left so long on the nest, but much of this fear is groundless. As a matter of fact, while eggs get broken and are eaten by hens, very few birds really learn to break eggs, and it is only these latter that cause the poultryman trouble in this respect. There are more ways than one of dealing with broody hens, but probably the best is to have crates with slatted bottoms in which to put them; there should also be a series of these crates, or compartments in the crate, so that the broodies gathered one day will not be put with those gathered on previous occasions. When all ages of broodies have to be put together, unless they are marked and the different dates kept, confusion is sure to arise as to which are the first or the last put in. It will, therefore, be seen that identification is absolutely essential to systematic handling of broody hens in order that they may be put back in some kind of sequence. Of course, it will be understood that some hens will take longer to get off the brood than others, but the backward ones can always be relegated to their proper position in the system. Another method of handling broodies that works well enough under some conditions, is to put them outside their ordinary enclosures, or in a yard in which all nests or cosy places where they can make a nest have been removed.

One consequence of neglecting broody hens is to encourage red mite and other parasites.

From time to time some panacea is supposed to have been discovered for curing hens of broodiness, but, so far, with no success; nor should the idea of the evolution of a non-broody strain of an Asiatic breed be entertained.

Housing the Pullets.

It should now be possible to estimate the number of pullets for which housing accommodation will be required, and provision should be made to meet it. Failure to provide sufficient room might result in great loss during the autumn and winter months from roup, which is almost sure to make its appearance where there is overcrowding and defective ventilation. Sizes of the different classes of houses required to accommodate different numbers will be found in these notes for December, 1917.

Fowl Tick on the Coast.

It has been generally assumed that the Fowl Tick (*Argas persicus*) is almost exclusively confined to the dry inland districts, where it thrives and is a serious obstacle to successful poultry-keeping. The assumption still holds good in the main, but some recent investigations have revealed the presence of this pest in the coastal areas; and while there appears no necessity for alarm, sufficient cause exists for a warning to poultry-keepers to be on the look-out for tick infestation.

Recently fowl tick has been discovered in four widely separated localities in the metropolitan area. The infestation has been of a much less serious character than is usually met with in the districts regarded as tick-infested, and, strange to say, in only one instance has the disease spirochætosis appeared to be associated with the tick—in other words, it would appear that the ticks in all but one case were not pathogenically affected. The case, however, in which they were, presented some interesting features. In this case the trouble appears to have dated back to the year 1908, when some fowls were suspected to be dying from cholera. The birds, it appears, were examined for that disease, but with negative results, the true nature of the trouble not being suspected.

Each year it appears that some birds were lost in the spring, the owner considering that it was probably a recurrence of cholera with the warm weather. However, eventually the Department was consulted, with the result that I investigated the case, and, on seeing the birds, at once expressed the opinion that it was a case of spirochætosis. Subsequent examination of the perches disclosed the existence of fowl tick, but only in small numbers. However, blood smears were taken and submitted for microscopical examination, as a result of which spirochætes, the organisms of tick fever, were found—thus, after ten years' existence, unearthing the true cause of the trouble. Fortunately, this was a private yard from which but few birds were sent outside.

It is not anticipated that the fowl tick will suddenly invade the coastal areas, but, since it has been found to exist, there is no guarantee that the tick will not become acclimatised and adapt itself to the new conditions. It has to be remembered that some bar exists, otherwise the ticks, having been prevalent for so long in the interior, would have invaded the coastal areas long ago.

Incidence of Fowl Tick Infestation.

Almost the first intimation I receive when visiting a district where there is fowl tick is being told that a large number of birds in the district are lost annually through cholera. This association has become so pronounced that there is little need to doubt the presence of tick wherever cholera is said to exist. This is on account of the accompanying diarrhœa in most spirochætosis cases. It is, of course, a wrong diagnosis, but one which it is difficult to persuade the poultry keepers concerned is wrong.

The Baffling Element.

The element that baffles the poultry keeper is apparently that while A has a gross infestation of tick, he is perhaps experiencing little loss of stock. At the same time B is perhaps doing his best to combat the tick, and has but a light infestation in his yards, yet he is losing a larger number of birds than A. This feature I have closely studied, and have come to the conclusion, based upon the examination of a large number of yards, that it is a question of immunity or degree of resistance developed by birds bred one generation after the other in tick-infested areas. It appears to be due to a degree of immunity developed in the progeny of immunized birds, *i.e.*, birds that have had and recovered from the disease. This has not been understood by poultry keepers, hence the doubt entertained as to the true nature of the trouble.

The explanation is that A is not introducing birds from infested areas, while B is bringing in birds from outside where the parent stock is not immunized. This is not mentioned to discourage the introduction of new birds to a district, but to bring out the true facts, so that the poultry keeper will be fully informed. The failure to introduce new blood would bring about a condition even worse than the ravages of the disease.

[In view of the importance of the subject, it has been decided to republish an article on Fowl Tick, which describes the parasite, and indicates the best method of control.]

The Fowl Tick.

JAMES HADLINGTON.

Perhaps the greatest handicap to poultry-keeping in some of the hot, dry districts of this State is the loss caused by fowl tick, *Argas persicus.* Yet all that is required to combat it is knowledge, and a little perseverance, such as is required to make any branch of agriculture a success. Admittedly the fowl tick is a serious problem for the poultry-keeper in these districts, but not more so than many other pests that the farmer is successfully combating. Reliable information on how it can be successfully fought and eradicated, and a proper method of keeping and housing the fowls, are the first requisites to successful poultry-keeping. One cannot help being impressed with the want of "system," as shown in the dilapidated poultry structures seen in all directions where abortive attempts have been, and are still being made, to keep a few fowls. Instead of the fowl being treated as a potential producer of a valuable product, and a most profitable one at that, it receives but scant attention, and is almost left to shift for itself. No intelligent farmer in any other line would expect such methods to be successful. Then why not apply a little common-sense attention to the poultry? This want of method is all the more surprising when one considers that in many country towns and hamlets in this State, such a valuable product as a fresh egg is almost an unobtainable luxury, although feed is cheap, and the only obstacle to successful poultry-keeping is want of knowledge and system in fighting the fowl tick.

Not so Formidable.

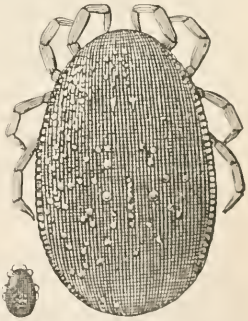
In the light of definite knowledge of the life-history and habits of the fowl tick, and the simple measures that have been found successful in its eradication, it is not nearly the formidable pest it is generally considered to be. In my contact with poultry-breeders all over Australia, I have for many years advised that kerosene emulsion, properly and systematically applied, would be found an effective weapon against this pest, and that there was no need for building houses with tar joints, &c., which in any case would only crack with age and form further harbour for the tick. I have carried out a series of definite experiments, which have proved this remedy entirely effective in the eradication of fowl tick. The method of destruction is so simple that, in my opinion, it should be made obligatory upon poultry keepers in infested places either to exterminate this pest or to give up poultry-keeping. It is, of course, understood thoroughly that a percentage of poultry kept in infested places become immune to the attacks; but the immunity thus obtained for a small percentage is at the expense of a large number, because it is only the survivors of an attack that become immune, while the greater proportion fail to survive. It is clear that poultry-keeping under these conditions can never be profitable.

Symptoms.

The symptoms exhibited by fowls having been inoculated by the tick with spirochætosis are not widely different from many other ailments from which fowls suffer. The chief distinguishing feature is a decided rise in temperature, varying in accordance with the severity of the fever. The fowl appears to mope a little, is apt to go off its feed, and is restless and evidently in distress; the feathers about the head appear ruffled, and often stand almost straight up; the face appears anxious and haggard, the comb turns dark and shrinks. There are often some symptoms of paralysis. Diarrhœa nearly always makes its appearance, and not infrequently the owners come to the conclusion that the fowls are suffering from cholera. When these symptoms appear, poultry-keepers in districts liable to tick should at once thoroughly examine their fowl-houses and roosts, or any places occupied by poultry; every crack and crevice in the immediate vicinity should be scrutinised to ascertain if there is tick infestation, and if so, the chances are that the trouble is traced to its source. It may be mentioned that the tick is less active in cold than in warm weather, and even where there is considerable infestation, it may not become apparent until the warm weather sets in. Another feature is that the older fowls having become more or less immune to the spirochætosis inoculation, the trouble is not so apparent again until the new season's stock is partly reared, when it has fresh blood to work upon, and the trouble reappears.

Life-history of the Fowl Tick.

Reference to the actual identification of the disease communicated by the fowl tick is made elsewhere, so it is proposed in these notes to adhere to the practical side, as can be seen and followed by every farmer in his efforts to rid his poultry-yard of the ticks. The adult tick is rarely found upon the fowl itself, except at night. During the hours of light it secretes itself away in the cracks and crevices of the fowl-house, fences, loose bark of trees, and any place where the fowls roost or congregate at night; there the tick lives and lays its eggs. When the larval tick hatches, it comes out and attaches itself to the fowl, principally on the parts least covered with feathers, such as under the wings, thighs, &c. The larval tick remains attached to the fowl for a few days, then assumes the nymph stage, drops off, and crawls into the crevice, and there casts its skin, and afterwards comes out for another engorgement; repeats this process, and ultimately emerges a full-grown tick, afterwards keeping up its periodical visits and round of existence.



Fowl Tick (*Argas persicus*).
The smaller figure shows a specimen life size.

It is customary for many writers to treat this pest as purely a bloodsucker, and many poultry keepers in infested places still cling to this notion, and ascribe all the trouble to this main cause and also to the irritation caused by the bites. The serious consequences have also been attributed to septicæmia, or septic blood-poisoning. These are, however, only part of the trouble. The really deadly effects of tick are caused by an actual blood parasite transmitted to the fowl by the tick, which induces a kind of fever. This runs its course in a few days, and either kills the fowl outright, or leaves it a wreck so that it either dies from anæmic conditions or survives and becomes immune to further effects of the inoculation by this parasite.

Piece of old splintered wood, infested with Fowl Tick.

How to Eradicate the Tick.

The first essential in attempts to fight the tick is to construct fowl-houses and roosts properly (not necessarily elaborately), and the birds should be so controlled that they will occupy the houses or roosts provided for them. It may be considered that this is not a practical proposition under all conditions; but I maintain it should be. The use of wire-netting and the application of intelligent methods will readily solve that problem. For instance, even when fowls are run at large on free range, they can be controlled at roosting time. All that is necessary is an enclosure of wire-netting attached to the fowl-house, where the fowls can be accustomed to feed. The gate of this enclosure can be shut, and the fowls confined to their house for the night. It has already been shown that the trouble from the tick comes at roosting time; therefore, if the fowls are confined to their regular quarters the tick can then be controlled in one spot, instead of in fences and trees all over the farm.

Open-fronted houses constructed of corrugated galvanized iron, with the framework on the outside, will meet the case, with or without suspended perches; but unless perches are so suspended as to be fairly rigid, it is best to abandon that plan. A non-rigid perch is only a delusion, and causes the fowls to camp on the floor of the house. This is worse than when the perches are on cleats.

The next best material with which to build houses is probably hardwood sawn palings, which, if well seasoned and put very close, edge to edge, make a fairly good house. The "lap and space" paling system is of course better from a construction and draught-proof point of view, but it affords more harbour for tick; but the worst of all material is rough bush timber, or tongued and grooved boards. These should not be used where fowl tick is likely to be troublesome. If corrugated galvanized iron be used, it should be painted to keep the houses cool.

Spraying the Poultry Houses.

To do this work properly, a good force-pump with hose such as is used by orchardists is necessary, so that every crack and crevice in the fowl-house can be reached with the kerosene emulsion. Where there is bad infestation, two, three, or even more sprayings are necessary. One spraying is of little or no use, and these should be given at intervals of a day or two between each, so that any that are missed by the first spray, or those dropping off the fowls at the period stated above, will be caught with the subsequent sprayings until they are all exterminated. When these spraying operations are thoroughly understood they involve less time than would appear at first sight.

How to make the Emulsion.

Boil 1 gallon of soft water and dissolve in it 8 ounces of soft soap, take off the fire, and add slowly 1 gallon of kerosene; stir briskly for ten minutes or more until the oil is thoroughly incorporated with the soap water, and appears like thick cream, then add slowly, stirring all the time, 10 gallons of soft water.

Among the waters suitable for making kerosene emulsion may be included the rain-water stored in tanks, the metropolitan water supply, that from most water-holes, and river water in general. Brackish and hard waters are not suitable for the purpose.

If a quart of wood-preserving oil (often known among poultrymen as "kerosene tar") is added to the emulsion in place of a quart of kerosene, it will be found more effective. The only objection to the wood-preserving oil is the soiling of the feathers of the white fowls.

Painting the roosts with wood-preserving oil can also be recommended as an additional preventive. The measures as above described are also most effective against ordinary hen lice.

The Fowl Tick and Spirochætosis.

From information compiled by the Veterinary Officers of the Stock Branch under the authority of S. T. D. Symons, M.R.C.V.S., Chief Veterinary Officer, it appears that this parasite, which is known as a spirochæte, has been found affecting fowls in parts of Queensland, Victoria, and many other parts of the world, and it has long been suspected that a similar tick fever was present in some of the dry inland districts of New South Wales. Examination of the blood of fowls clinically affected has been made, and spirochætes were found to be present in large numbers. There is now little doubt that these parasites are prevalent in this State in many places where the ticks are found.

The spirochæte (*Spirochæta Marchouxi vel gallinarum*) when viewed under the microscope resembles a spiral or a corkscrew in shape, with both ends tapering. In length it varies somewhat, but in any case it is extremely minute. When fresh blood is examined, it is seen to be moving very actively among the corpuscles, which it lashes in all directions.

If blood is taken from a fowl suffering from spirochætosis and inoculated into a healthy fowl, the disease is produced, and in a few days parasites are found in the blood. The tick, of course, is the normal infecting agent, and, so far as we know, the fowl can only become affected by inoculation by the tick. The parasites multiply rapidly in the blood, and later on are usually found collected into bundles or clumps. After this stage they usually disappear from the blood, though the bird may become weaker and die. If, however, it passes through this stage and recovers, it generally becomes immune to further attacks.

Post-mortem Appearances.

There is little to be seen. Usually the spleen is somewhat enlarged, and the liver congested, while examination of the blood shows changes due to anæmia. The parasite is difficult to discover in the blood after death.

Protective and Curative Treatment.

An attack of the disease renders the fowl immune, and inoculation of the serum from a bird that has recovered will protect a hitherto unaffected fowl from spirochætosis for a short period. Preparations of arsenic have been found to have some curative properties.

From a practical point of view, however, neither artificial immunization nor drug treatment compares with the institution of measures to eradicate ticks from the fowl run. These are the agents concerned in transmitting the spirochætes, and the ticks being destroyed, it follows that the fowls will be free from the disease. In short, the destruction of the tick removes the agent by which the disease is transmitted to the fowls.

Agricultural Bureau of New South Wales.

Since the commencement of this movement in 1911 highly satisfactory progress has been made, as will be observed on reference to the long list of country branches, and on perusal of the notes of meetings of the various branches published herein from time to time.

The main objects of this organisation are to impart agricultural education to farmers by means of lectures and demonstrations by departmental officers, and to encourage farmers to assist one another by gathering together regularly and exchanging their ideas and experiences, principally as regards local conditions, and, of course, regarding agriculture generally.

Farmers are invited to join the local branch, and can do so by getting into touch with its honorary secretary.

In districts where no branch exists, farmers are asked to co-operate with the Department in endeavouring to establish a branch. Full particulars regarding the usual method of procedure, &c., will be furnished on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Notice to Honorary Secretaries.

It is important that regular monthly meetings should be held, and that a record of the meetings of the branches should be inserted in the *Agricultural Gazette.* Honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 14th to ensure insertion in the following month's issue.

Each branch when formed is supplied with a set of available *Farmers' Bulletins,* and from time to time new bulletins are sent to the secretaries for addition to the files. In addition to this, individual members can also procure copies of any bulletin or publication that may be of interest to them in their particular branch of rural industry, by applying for the same through the secretary of the local branch

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of the common insect pests o the district, and collections are cased as required. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Formation of Libraries.—It is suggested that each branch should arrange to establish a library for the use of members; it is thought that this would be a capital way of expending surplus funds.

Secretaries of any branches which may decide to form a complete library are invited to communicate with the Department in the matter, and they will be furnished with an appropriate list of standard works.

Demonstrations in use of Explosives.—A limited number of demonstrations in clearing land with explosives will be given by Mr. C. W. Burrows, Field Assistant. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, or perhaps the failure of the writer of a promised paper, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

> Do you consider the natural pastures on your farm sufficient for profitable dairying all the year round? If not, what crops best suit your conditions for—(*a*) green winter feed, and (*b*) green summer feed? Have you had any experience with legumes, such as vetches or or peas, in combination with cereals, and was the result favourable?
>
> What birds common in your district do you consider the most valuable from the producer's point of view? Have you observed any in particular attacking (*a*) moth larvæ in fruit districts, (*b*) mice or grasshoppers in grain districts, or (*c*) sheep-maggot flies where they are troublesome? What methods do you think might be adopted to control birds that are injurious to farmers' interests?
>
> When green feed is scarce at lambing time, do you use any succulent fodder as a substitute? If so, what do you prefer as a milk producer in ewes? Have you had any experience with autumn-sown crops or with silage for this purpose, and how do they compare as to cost with dry fodders like lucerne or wheaten hay?
>
> What varieties of fruit do you consider the best for your district on a purely commercial basis? Many unprofitable or unsuitable varieties are being grown in all parts of the State. Have you any such, and what are their names? Have you worked any unprofitable trees over to better or more suitable varieties, and with what results?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bankstown.

A meeting was held on 21st October. Mr. E. N. Ward, Superintendent, Botanic Gardens, gave a lecture on propagation and hybridisation, a résumé of which follows :—

PROPAGATION AND HYBRIDISATION.

The chief methods of propagation were explained and demonstrated, also the process of natural and artificial fertilisation of flowers, with a view to the better understanding of the subject of hybridisation.

The lecturer emphasised the importance of obtaining good and fresh seeds. When a good strain of flowers was obtained in any garden, it was advisable to reserve a few of the very best blooms for seed purposes, rather than trust to the seedsman to repeat the success. Often a strain was improved in this way by careful selection, and this improvement was different to improvement by artificial fertilisation, which was a more delicate but not more important process, for many good kinds of fruit, flowers, or vegetables obtained by fertilisation had been lost by careless selection. Seeds so saved should be kept in tins with a pinch of lime to keep weevils away, as much havoc was caused by this seed pest. When it was not feasible to save seeds, then other methods had to be adopted to perpetuate the strain or variety; and it was stated that whether the method was by cuttings or grafting, little change had taken place in general practice. From the earliest times it had been the custom to raise and improve plants by artificial or asexual means. After the raising of plants from seeds the next most important method of propagation was by cuttings. A "cutting" was the gardener's name for a piece of the stem, root, or leaf. American horticulturists called this method of propagation "cuttage."

There were three kinds of cuttings—stems, roots, and leaves; and these headings were subdivided. For instance, stem cuttings were made (*a*) from growing wood, and (*b*) from ripened wood; (*a*) was again divided into (1) soft, as in geraniums, and (2) hardened, as in roses; (*b*) was also divided into long cuttings, as in willows, and short cuttings, as in bamboos. Root cuttings were divided into (1) short, as in bouvardias, and (2) long, as in *Rubus*; leaf cuttings were divided into entire as in Echeveria; divided as in begonia; and by scales as in lilies. These several divisions of cuttings required different methods of treatment and operation.

Another important method of propagation was that of grafting, and this comprised the process and operation of inserting a part of one plant into another, which must be of the same family. There were three chief kinds, viz.:—bud-grafting or budding; scion grafting, or what was known as grafting proper; and inarching, or grafting by approach, and the methods for each kind of grafting were as various as those adopted for cuttings. By these processes young fruitful heads might be put on old shoulders, and if a tree be a healthy one bearing worthless fruit, it could be made to produce superior fruits.

The most interesting of all methods of raising plants was by hybridisation. It was more interesting to raise plants from seeds than to buy the plants already partly grown. It was also an interesting part of the hobby of gardening to propagate plants after having raised them from seed; but it was far more fascinating to raise an absolutely new plant—a new creation. Even if there were many failures from a floral point of view, the few successes more than compensated for the time and patience required.

With very little study anyone who was fond of gardening could become a hybridizer, an originator of new plants, and thus add to the beauty of a beautiful world. It was safe to assert that the most valuable and beautiful creations in the vegetable kingdom had resulted from the work of the amateur, who treated the subject solely as a hobby.

Bimbaya.

At the last monthly meeting a discussion on pig-raising took place.

Pig-raising.

Mr. T. **Heffernan** considered the pig industry only yet in its infancy in the district, and with the establishment of a bacon factory double the number of pigs could be raised. He thought that lucerne was one of the best crops for pigs, especially in the early stages of growth.

Mr. E. T. **Boller** thought skim milk, when fed to pigs without the addition of meal or some similar food, was insufficient, as it was not a properly balanced ration. He quoted figures to show that uncooked maize was far superior to cooked maize as a pig food.

Mr. J. R, **Boller** preferred the Tamworth-Berkshire cross for bacon pigs, and for porkers the Middle Yorkshires were equal to anything he had seen.

Mr. **George Alcock** also preferred the Tamworth-Berkshire cross for bacon. He considered that any care and attention given to pigs was well repaid. There was no reason, as far as he could see, why the number of pigs raised in the district should not be greatly increased.

Buckaroo.

A meeting (which took the form of a very enjoyable picnic) was held on 29th October, when Mr. C. W. Burrows, Field Assistant of the Department of Agriculture, conducted a demonstration in the use of explosives for clearing land.

Clearing Land with Explosives.

Mr. Burrows explained what gelignite is, and its relation to and advantages over other kinds of explosives, and the principles that govern its use in the economical clearing o land. The first stump operated on was a dry box, about 4 feet through at the ground. Four holes were first put down by means of the bar and ground auger, so as to get the charges underneath the stump; these were each charged with five plugs of gelignite, and a similar charge was placed down the hollow from the top. The charges were then connected up and fired with the battery. The result was that the stump was quartered up and lifted completely out of the ground, some of the pieces being blown some distance away.

The demonstrator clearly explained the different operations, such as the use of the bar and auger in putting down the holes for the charges, the method of placing the plugs in the hole, the inserting of the electric detonator in the priming plug, the tamping of the charge, the connecting up with the cable and battery, and the use of the battery.

The next stump was a green gum, about 18 inches through. Five plugs were placed under this and fired with the fuse. The stump was raised some distance, but was not blown out of the ground. A hole was then bored in the stump and three-quarters of a plug inserted and fired for the purpose of demonstrating how it might be shattered to assist burning. While preparing the charges for this stump, Mr. Burrows explained the methods of firing with the fuse and ordinary detonator.

Three plugs were then put under a dry box stump, about a foot through, and fired, with the result that it was blown right out of the ground. The demonstration proved highly interesting and instructive to those present, who were thus shown the correct method of handling a reasonably safe explosive that can be put to various uses on the average farm.

Clovass.

A meeting was held on 19th September. A committee was elected to purchase seeds to grow vegetables for an exhibit at the next Richmond River A., H., and P. Society's show at Casino.

A lecture on Ayrshire cattle was given by Mr. D. W. Cowan.

AYRSHIRE CATTLE.

Mr. COWAN said that Ayrshire cattle, as an improved breed, had only been known about 100 years. Three of the main points for a good milker were large wide hips, a well marked escutcheon, and a loose yellow skin. The ribs should be well sprung, with a good straight back. The cow should be high behind and low in front, and should have short fine legs. He further stated that he always found the Ayrshires good tempered and easy to handle, also that the cows milked well until they were 12 years old. He had found that the Ayrshires crossed best with the Durhams, but he believed that it was better to keep them as pure as possible.

DEPARTMENTAL NOTE.—The Herdmaster of the Department points out that a good dairy cow often gives the appearance of being high behind and low in front on account of the pelvic arch being rather pronounced.

A lecture on dairying subjects was given by Mr. O. C. Ballhausen, Dairy Instructor, on 15th October, and was greatly appreciated by the large number of members present.

Cordeaux-Goondarin.

A well-attended annual meeting was held on 23rd October. The election of officers resulted thus:—Chairman, Mr. H. E. Cowain; Vice-Chairman, Messrs. Woodyatt and Murphy; Treasurer, Mr. R. J. Fishlock; Hon. Secretary, Mr. G. H. Walker.

It was decided that the branch be represented at the Primary Producers' Conference in Sydney under the auspices of the Royal Agricultural Society.

Cotta Walla.

At a special meeting on 4th September, Mr. R. N. Makin, Inspector of Agriculture, delivered an address on methods of increasing the yields of crops. The attendance was not large owing to inclement weather, but those who braved the elements were rewarded with a very interesting lecture, of which the following notes were taken :—

METHODS OF INCREASING THE YIELDS OF CROPS.

One method of increasing the yields was by placing in the ground suitable plant food; the chief elements required by plants were phosphates, nitrogen, and potash; and as plants took their food through the roots, the food must be soluble.

The usual method of adding phosphates to soil was by applying superphosphate. This consisted of a rock found in the Pacific Islands, which, after being ground fine, was treated with sulphuric acid to make the phosphates soluble. Bone-dust was also used with advantage, and a mixture of equal parts of each was recommended.

To add nitrogen to a soil, sulphate of ammonia, nitrate of soda, or dried blood might be applied; but all these manures were very expensive, and it was doubtful if the yields from crops other than those required for green fodder purposes would warrant the expense.

Another method, and one that would be applicable to this district, was the ploughing in of leguminous crops, such as clovers, lucerne, vetches, peas and beans. These plants had special means of securing nitrogen from the air, and had small growths on the roots which stored up nitrogen. Another great advantage of ploughing in leguminous crops was that the humus or vegetable matter made heavy soils more friable and mellow, that it kept sandy soils cool, and increased the water-retaining capacity of loose soils.

Potash was unobtainable now, for it was a German product; but probably after the war supplies would be forthcoming, for there were huge deposits in France, particularly in the provinces of Alsace and Lorraine.

In potato experiments on the coast, the best results had been obtained with P5 mixture (four parts superphosphate and one part sulphate of potash). The mixture P7 (equal parts of superphosphate and bone-dust) was a good manure for hay, maize, and potatoes, for it was a combination of quick acting and slow acting manures; superphosphate was readily available for the plant, and gave it a good start, while bone-dust was of benefit in the later stages of growth. Artificial manures gave best results when the soil was well drained and well aerated; dry seasons were against manures, as moisture was necessary. It was always noticeable that even if manures did not increase the yield the crop included a larger proportion of saleable potatoes. Excellent results were obtained on the South Coast by ploughing red clover in with potatoes. Mr. Makin hoped it would be given a trial in this district. Reference was also made to the marketing of potatoes, and members were urged to give careful consideration to classing and grading. The advantages of marketing their produce in as attractive manner as possible were also pointed out.

Cunningham.

A demonstration and lecture was given to members of this branch on 30th September by Mr. J. W. Mathews, Sheep and Wool Expert.

Mr. Mathews intimated that the State Committee which was handling our wool had taken exception to the manner in which small clips were being placed before the appraisers, and it was in the interests of growers that such a state of things should terminate. A Merino wether was shorn, the fleece correctly picked up and put on the sorting table, and the wool classed and graded.

The visit and the demonstration were both highly appreciated by members.

At a meeting on 15th October a paper was read by Mr. H. J. Middleton, junior, of which the following is a portion :—

FALLOWING ON THE FARM.

Before fallowing, it is advisable to stock the land as heavily as possible, in order to get all profit there is to be had from the vegetation on it before ploughing. It will be necessary to know what weeds have to be contended with. The three main pests in this district are sorrel, thistles, and black oats, and it will be necessary to prepare the land in such a way as to deal most effectually with these. Assuming that the land to be fallowed has been under cultivation for a number of years, it will probably be infested with sorrel and black oats.

Now, as the latter will not be showing to a great extent when fallowing begins, the time to commence fallowing will depend upon the stage at which the sorrel is. So that the greatest quantity of it may be killed, ploughing should be left until the sorrel is in flower. At this stage all plants are more easily killed than at any other.

The land should be ploughed to a depth of at least 5 inches, and 7 inches if possible. The more deeply the soil is worked the easier it will afterwards be to deal with it. Deep cultivation retains the moisture and gives a greater depth of sweetened soil. A plough that packs the soil well and makes a nice even ridge with every furrow should be used. The benefit of these small ridges is that they can afterwards be harrowed across the ploughing, making a nice smooth surface which will retain moisture. Supposing that the land has been ploughed as described above, the next step will be to consider when it should be harrowed. In most seasons, about three weeks afterwards will be a long enough interval before harrowing. Of course, where fallowing is being carried on extensively, it will be impossible to adhere to this rule. By harrowing fallowed land the farmer is able to kill a lot of small weeds and any sorrel or oats that are not firmly in the soil. Harrowing should always be done across the previous working, no matter what it was.

The fallow can now be left until just late enough to allow it to be worked once before harvest. It is desirable, if possible, to allow the surface of the fallow to become hard before the first working takes place. This causes a cloddy surface, and prevents the soil from becoming too fine when broken up, for that means much working afterwards.

Disc implements are beyond doubt the best for the first working, preferably a disc cultivator. Disc implements have this advantage over all others—that they move absolutely every bit of the soil, whereas other implements always leave a small cone between the teeth. Thistles cannot be effectually dealt with, except by a disc. They are straight-rooted plants, and spring-tooth cultivators will run each side of the strong roots. Sorrel is chopped to pieces and its rope-like roots are well separated by the use of a disc.

By October or November the growing crops elsewhere on the farm will require attention, and the fallows will for the time being have to be left. Any weeds that come up after this can be kept in check by sheep and turned to good account instead of being allowed to dirty the soil. After the disc-cultivating the soil will be in rather a rough state, and should be worked again as soon after harvest as possible, so as to again disturb the sorrel before it can become established afresh.

The next working will be with the spring-tooth cultivator, with narrow shoes, so that the working may be deep, again disturbing sorrel that has not been killed by the disc. All thistles will, of course, easily be killed by the first working with the disc. The spring-tooth cultivator has many advantages. The first is that it brings the clods to the surface and leaves a fine bed underneath. Sorrel and other weeds will also be brought up, where they will be quickly killed by the hot sun. The number of times that fallowed land has to be worked will depend to a great extent on the weather conditions. In dry seasons weeds are much easier to kill that in wet ones, for the simple reason that dry soil will not permit abundant growth. Assuming now that the soil has been worked until all weeds are practically exterminated, it should be in very good order for sowing.

It is absolutely useless to work fallowed land when in a wet state; where there is sorrel, the drier the weather the better, the roots being easily killed when exposed to the sun.

Black oats are altogether different, and will not germinate to any extent except in the cold months of the year, or after a big fire has gone over them in the stubble. In fallowing land for black oats, it will be necessary to plough in June or July, and afterwards to work the surface whenever the oats have come up thickly. A combination of oats and sorrel is an impossible job to tackle. What kills one will make the other thrive. Crops sown on fallowed land can easily be picked out from all others sown in the usual way, and will as a rule show a profit of 75 per cent. more than ordinary methods.

Dural.

On 4th October a meeting was held, thirty persons being present. An interesting lecture was given by Mr. A. A. Ramsay, Assistant Chemist, on manures, a résumé of which is as follows:—

The Use of Manures.

After dealing exhaustively with the food requirements of various plants and the conditions necessary for its assimilation, Mr. Ramsay undertook the answering of questions. Quite a number were asked, and the replies given supplied just the information most needed by those present.

In answer to a question why it was that citrus trees would not thrive on ground from which old citrus trees had been removed, Mr. Ramsay explained that after a tree had been planted for some years a toxin was produced in the soil, which had a poisoning effect upon the tree, thus rendering a change to another variety necessary. It was also pointed out that the toxin that was injurious to citrus trees might have no ill effect on trees of another species.

This explanation was of special interest, as it is well known in this district that to plant citrus on old citrus ground is just courting failure. Summer fruit trees do well on old citrus ground and *vice versa.*

Mr. Ramsay also pointed out that certain manures had a counteracting effect upon certain toxins.

In answer to a question on green manuring, the lecturer strongly recommended this practice of restoring humus to the soil, and advised the growing of crops that suited the soil and climate best. There would then be no great depreciation in the effectiveness of manures should dry weather follow after sowing. Rain, of course, was necessary to render the manure available to the plant or tree. To the question, "If superphosphate was sown in a dry time, would it revert to the insoluble form," the answer "yes" was given.

The urgent need for potash supplies was dealt with, and Mr. Ramsay stated that he feared that no potash would be available until after the war. Potash could be obtained from seaweed, but the undertaking involved the expenditure of too much capital, unless some specific guarantee was given with regard to the maintenance of the present price of potash. This district was deficient in potash in the soil.

Information was sought as to which was the better manure from the unit value standpoint, sulphate of ammonia or nitrate of soda. After working the matter out on the prices given, the lecturer declared in favour of the former according to the unit value.

For the forcing of the crop on summer fruit trees, nitrate of soda was recommended in preference to sulphate of ammonia, because of its quicker action.

Glenorie.

The annual meeting of members was held on 31st August, and there was a good attendance. The election of officers resulted as follows:—Chairman, Mr. F. A. Nicolson; Vice-Chairman, Mr. E. King; Hon. Secretary, Mr. J. Hutchinson.

Two new members were enrolled.

A meeting was held on 26th October, when discussions took place on Black Spot in oranges, the high price of fodder, the cause of the light crop of apples, &c.

Holbrook.

A meeting was held on 25th September, and a lecture given by Mr. J. W. Mathews, Sheep and Wool Expert, entitled "Sheep: the Breeds suitable for the District."

Kellyville.

On 5th October a meeting was held, eighteen members being present. Ordinary matters relating to the work of the branch were dealt with.

A demonstration and a lecture were given by Mr. W. le Gay Brereton, Assistant Fruit Expert, on 25th September. The demonstration was held in Mr. Boulter's orchard, and consisted of the renovation of an old "staggy" lemon tree, and the thinning-out of a thickly-wooded orange tree. A visit was made to Mrs. Agnew's orchard, and some apple trees which were infested with woolly aphis examined. They had been treated with lime, and the aphis showed signs of disappearance. Mr. Brereton was of the opinion that the lime should be given a further trial.

The lecture on woolly aphis at night proved very interesting. Mr. Brereton dealt with his past experiences in connection with this pest at the Glen Innes Experiment Farm.

A meeting was held on 4th November, eleven members being present, when a lecture was given by Mr. J. Nutter on how to make a vineyard and to treat the vines. The lecture proved of great interest to all present.

Lidcombe.

A meeting of members was held on 21st October, about sixty members being present. Matters relating to the operations of the branch were discussed, and Mr. A. H. Jones was elected Chairman, *vice* Mr. F. G. Brown resigned.

An interesting and instructive lecture was given by Mr. H. W. Potts, Principal, Hawkesbury Agricultural College, on pig-raising. He described the various breeds and crosses of pigs, and explained how and what to feed pigs on to obtain the maximum weight in the shortest time. The diseases to which pigs are subject, and the preventive and remedial measures to be adopted to combat same were fully explained. Mr. Potts concluded by saying that there was no more suitable place in the world than New South Wales for pig-raising, and that those who embarked in this industry would be amply rewarded.

At the next regular meeting an address was given by Mr. F. Walford on the honey bee, in which he both instructed and entertained his hearers.

Some fine exhibits of flowers and vegetables were shown among the monthly exhibits, in which members are again taking a keen interest.

Lisarow.

A meeting was held on 14th October, fifteen members being present. Delegates from Gosford A. and H. Association attended, inviting this branch to stage a village exhibit in the district competition at next Gosford show, to be held towards the end of January.

On 10th October a demonstration was given by Mr. C. W. Burrows, Field Assistant, on clearing of land with explosives. The demonstration was much appreciated by those present.

Narellan.

The members of the above branch met on 18th October, when discussions took place on several matters of interest.

It was stated that the indications favoured a good crop of stone fruit, while the vineyards also looked well, and free from disease. Peach aphis was said to be troublesome in places; it could be controlled with tobacco wash, provided it was thoroughly and frequently applied with a good pressure.

The disease die-back was reported to be much in evidence this year, many trees that had been highly cultivated, and that were growing splendidly last year, having failed to start into growth this spring.

Inquiries were made as to any experience with loganberries. In some places the fruit had proved profitable, and information as to its suitability to the district was specially desired by one member who was interested in the small fruits.

Two delegates were appointed to represent the branch at the Primary Producers' Conference in Sydney.

Orangeville.

The usual meeting was held on 14th September. Mr. Salway gave an interesting address on horse-shoeing, giving his experiences in shoeing his own horses during a number of years, and pointing out the great saving in cost. A general discussion took place after the address, and much useful information was gained by members, who agreed that it was advisable to shoe their own horses if at all possible.

Penrose-Kareela.

The monthly meeting was held at Penrose on 12th October, when Mr. H. Teudt was elected Chairman in lieu of Mr. J. Mashman, deceased. A discussion took place relative to additional facilities required at the local railway station, and it was decided to approach the Railway Commissioners on the matter.

The annual meeting was held on 9th November, and there was a good attendance. The usual business was gone through, and office-bearers were elected for the ensuing year as follows:—Chairman, Mr. H. Teudt; Vice-Chairman, Mr. O. Clews; Treasurer, Mr. V. S. James; Hon. Secretary, Mr. L. S. Pieremont.

Springside.

A meeting was held on 17th September, and eighteen members attended. A paper was read by Mr. Bowen on green manure for potatoes. Mr. J. Naylor gave his experiences in connection with ploughing down a good crop of clover. He stated that at the present time he had a splendid cereal crop growing. Previous to the use of clover the field gave little or no return.

Stratford.

A meeting was held on 5th October. The business included a paper read by Mr. T. Germon on poultry farming, a résumé of which follows:—

Poultry and Poultry Farming.

The first thing in poultry keeping is a good run and a good aspect. This needs to be an easterly sloping ridge, with not too much stone. The next thing required is protection from the weather. If the site affords no natural shelter a shed should be provided, however rough. It is not generally known that westerly winds stop fowls from laying, but this I have proved.

In penning poultry at least 16 square feet should be allowed for each six fowls. Pens are a necessity if the farmer wishes to keep a distinct breed.

The best method in commencing poultry farming is to select pure-bred stock, of which there are about five breeds that he regarded as of equal merit, while for egg-production the White Leghorn stands alone, provided the situation is not too much exposed to the weather.

For open runs and not much protection, the Black Orpington will be found the best layer, a good setter, and an excellent table fowl. Other breeds, such as Brown Leghorn, Black Minorca, and Andalusian are to be recommended. The Black Orpington possesses a massive body, deep prominent breast, with short clean legs, feathers of black with a purple-green sheen, combs small, single, and upright. This breed was produced by Mr. Cook, of Orpington, in Kent, England, by crossing a large Minorca cock with black Plymouth Rock hens, again crossing the result with the clean-legged Langshan, and breeding afterwards by selection. The two original varieties of Leghorns are white and brown—all others being made up. They originally came from the Mediterranean Coast, and are all of one type, though differing in minor points. They have high single combs, large wattles, and white ear lobes, smooth legs and close plumage. They are non-setters, and lay a large white egg.

A meeting was held on 2nd November. General business was dealt with, including an intention to increase the number of books in the branch's library. A paper was read by Mr. H. T. Perrin, of which portion follows:—

BEE-KEEPING.

The first thing to be considered in starting an apiary is the locality. A site should be chosen within easy access of a good variety of timbers. In the meantime do all the study possible, and visit some competent bee-keeper, and watch closely his methods of working the bees.

Having selected the hive, the next thing required is a stand. Railway sleepers, or wood of similar size, cut in lengths corresponding with the hive, make excellent stands. This keeps the hive a nice distance from the ground, and gives easy access to the bottom of the hive in case spiders accumulate, which they are nearly certain to do. In nailing the frames, always keep the V edge the one way, otherwise it will be very inconvenient, if the necessity arises to exchange frames. By having all parts interchangeable much time and labour is saved. Never leave empty storeys or frames laying about, as they harbour the bee moth. In selecting a strain of bees, care should be taken to select good queens from a reliable bee-keeper. Full sheets of comb foundation should always be given, as the hive will be filled in much less time. The time saved in this manner will always compensate for the extra cost of full sheets. In opening a hive great care should be taken not to bump it. The best method is to gently raise the hive and insert a little smoke at intervals; this tends to quieten the bees. Hives should be always faced to the east, so that they may get the early morning sun. This is also a protection from westerly winds, and the bees further have the benefit of the shade of the hive in the afternoon, which is very essential, as it tends to keep the young larvæ cool. Never allow young brood to be exposed to the sun on a hot day, as they are apt to perish. A good method of preventing a new swarm from leaving the hive is to give them a frame containing eggs and young larvæ, also sheets of foundation comb.

Toronto.

On 1st October a meeting was held, and demonstrations on budding of roses and budding and grafting grape vines were given by Messrs. Filmer and Cockburn respectively.

A meeting was held on 5th November. The usual business was gone through, and a discussion took place on summer pruning and spraying. Arrangements were also made in connection with the forthcoming show.

Walla Walla.

On 27th September Mr. J. W. Mathews, Sheep and Wool Expert, visited Walla Walla, and gave a demonstration of methods of handling sheep and wool, which was much appreciated by all present.

Wellington.

A meeting of this branch was held on 22nd October, when a paper was read by Veterinary-Sergeant Smith, in which he dealt with the common diseases of horses, and made a number of suggestions for their simple treatment. The paper was much appreciated, and the vote of thanks at the close was a very cordial one.

Windsor.

The branch met on 20th September, when a lecture was given by Mr. B. C. Meek, Assistant Inspector of Agriculture, of which a report follows:—

POTATO CULTURE.

The potato was introduced into Europe during the sixteenth century, but was not cultivated to any extent till the seventeenth century. As a food it was at first looked on with great suspicion, but prejudice was gradually overcome till at present it comprises 20 per cent. of the food of Europeans. So much did the inhabitants of Ireland become dependent on the potato for food that the crop failures between 1840 and 1850 resulted in famine. Statistics show the value of the world crop at £200,000,000, of which our proportion in Australia is £1,500,000.

Our table potato is an enlargement of an underground stem, which is short and thickened, and is used by the plant as a storehouse. The planting of these tubers may encourage disease, for they contain whatever inherent weakness there was in the original plant, and deterioration is sure to occur if seed tubers are not carefully selected. The plant in its wild state produced many berries and numerous small tubers, but selection and cultivation has practically eliminated the berries from some varieties, and the tubers have become fewer in number and larger in size.

In a rotation, potatoes are very suitable to precede maize, and in this district when planted early it is a very payable crop, being marketed between the early Clarence River crop and the main crop from Tasmania and the highlands.

In regard to the soil, the physical or mechanical condition is more important than fertility, though a rich soil with a proper supply of humus is required for the fullest development. It needs a loose, friable, well drained, easily worked and perfectly aerated soil.

Climatic conditions in its native habitat only give a growing season of 100 to 110 days, so that our highland districts are nearest to natural conditions. Good payable crops can be obtained on the alluvial flats of our coastal rivers, but it is advisable to obtain seed from a colder climate; such seed is freer from disease, and is generally "immature." The immature tuber has not exhausted itself in the production of starch, the plant processes having been interfered with by frost, and such seed uniformly keeps better in store, and produces a better plant.

In selecting a variety, the requirements of the market must be considered. A large coarse variety with deep eyes may be a good yielder, but the medium-sized smooth potato with shallow eyes will bring more per hundredweight. Up-to-Date has been the most consistent general cropper for this district, and Factor is a new variety of promise, while Carman No. 1 is a good early variety.

Seed should be spread out on the floor of a barn, or in the open, with a thin covering of straw, for a few weeks before planting, so as to induce the growth of short green shoots. Whole seed is preferable to cut seed, but if diseased or "run out" seed is suspected, it is advisable to cut a piece off the end of each tuber.

The rows should be 2 feet 6 inches to 3 feet apart to allow of free access of air and sunlight, and for cultivation purposes. Plant the sets from 12 to 18 inches apart, according to moisture and fertility of the soil. The furrows in which the sets are placed should be from 3 to 5 inches deep. If the soil has been thoroughly worked up prior to planting, the tubers will go down into the loose soil.

The chief disease is Late or Irish Blight, which is responsible for as much damage as all the other troubles of the potato grower put together. It generally makes its appearance in November, and there is no cure for it. Preventive measures, such as spraying three to five times during the growing season with Bordeaux mixture, can be taken. Clean seed when planted in clean ground is only subject to infection from spores from affected plants, and these spores on coming in contact with the Bordeaux mixture are destroyed. Tomatoes and a few native plants are also subject to blight.

The manure found most suitable by the Department of Agriculture, in the absence of sulphate of potash, is the mixture known as P7, which consists of bone dust and superphosphate in equal parts.

In Europe, spirit, flour, and other commercial products are obtained from the potato.

Woonona.

At a meeting on 8th October a paper was read on the culture of rhubarb by Mr. E. Thomas. The following is a summary:—

METHODS OF RHUBARB CULTURE.

There are two methods of growing rhubarb, which I have tried on the South Coast during the last four years, viz., growing from seed to obtain strong, vigorous crowns in the second and third years, and endeavouring to increase the plants by division of crowns. The latter method I have abandoned, as I found that the roots lost their vigour after the second year, many dying outright. By far the best method, in my opinion, is growing from seed each year. It is possible to get useful crops of rhubarb from seed to maturity in 20 to 25 weeks. This seeding should supply the grower's wants until the seedling plants of the following year come into use, and it is to this method of growing from seed each year on an intensive system of cropping that I wish to call your attention.

The plants do not require a great amount of sunshine, and any spot that is partly shaded would suit. The soil should be well drained, and a good dressing of manure should be deeply dug in. This treatment will put the land in good heart, and this is necessary as the crop will occupy the ground somewhere about eighteen months. Work the soil until a fine tilth is obtained, as this will greatly assist the seedlings along in their infancy. Soil which is of a moisture-retaining nature—not stagnant for want of drainage—is very good for this crop.

Having prepared the soil by getting it to a fine tilth, sow the seeds in drills 2 feet apart, and cover them to the depth of ½ inch. See that the soil is not too dry, or it will retard the germination of the seed. Should the surface soil be very dry, it is advisable to give the drills a good watering before sowing the seed. After sowing, make the surface of the seed-bed firm. When the seedlings are in the second leaf thin them out, leaving plants 2 feet apart. Those thinned from the seed-bed can be transplanted, if desired. During the early stages of their growth the plants should not be allowed to want for moisture. When the plants are well established the liberal use of liquid manures will greatly assist them in coming to early maturity.

Do not pull stems until the plants are well established. Many crowns are destroyed by too early pulling, or by being stripped of their stems. It is advisable to take a few stems from each plant with a gentle twist. This is much better than pulling, and will not destroy the crown nor injure the root system.

Do not let the plants go to seed, or the crop of rhubarb will suffer. A mulch of manure will greatly assist yearling plants.

Yurrunga and Avoca.

A very successful and interesting meeting of members was held at the farm of Mr. Masters, Avoca, on 19th October, for the purpose of viewing experimental plots of grain and vegetables grown by Mr. Geo. Bisby, one of the members. The grain had been sown on 2nd May, which is very late for the district, yet the growth had been remarkable. Rye was 6 feet in height, and oats 4 feet to 4 feet 6 inches. The seeds of most of the varieties were obtained from the Department of Agriculture.

The consensus of opinion was that the best varieties of oats for winter feed were Carter's Royal Cluster, Abundance, and Big Four, and for hay—Brown Calcutta, Algerian, Lachlan, Ruakura, White Tartarian, and Sunrise. There was also a fine sample of Potato oats, which was free from rust. Special mention was made of the new Banner oat, which is a very fine type, and with good flag; it should be a very valuable addition to oats in the district.

The following wheats were grown side by side:—Florence, Marquis, Steinwedel, and Thew. Florence was certainly the best; but that may be accounted for by its being from acclimatised seed sown by Mr. Bisby. Thew looked remarkably well.

The barleys were represented by Kinver, Golden Grain, Standwell, Goldthorpe, Skinless, English, and Cape. The first-named looked the best.

The potatoes grown were Manhattan, Satisfaction, Cambridge Kidney, Queen of the Valley, Southern Star, Early Vermont, Carman, Brownell's Beauty, White Early Rose, Early Rose, and White Elephant; and the onions—Potato, Tree, Early Yellow Globe, Early Flat Red, Spanish Globe, and Anderson's Market Model.

Parsnips and carrots were also included in this splendid display—the growth of all being as near perfect as possible. Some samples were taken away to be shown in other localities.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	A. Buchhorn, Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bankstown	J. W. Cunningham, Brancourt avenue, Bankstown.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	J. R. Boller, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Buckaroo	P. J. Crowley, Buckaroo.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F. W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton, Comboyne.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kerk, Black Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	———
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Ck., Frogmore
Garra & Pinecliff	S.W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jilliby-Dooralong	K. A. Smith, Jilliby, Wyong.
Jindabyne	Sylvester Kennedy, Jindabyne.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	J. M. Firth, Kellyville.
Kyogle	J. Martin, Kyogle.
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	H. Laman, Martin-st., Lidcombe.
Lisarow	A. L. Kelman, Lisarow.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	T. L. Williams, Meadow Flat, via Rydal.
Middle Dural	A. F. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	S. J. Richardson, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya
Moss Vale	W. G. Bale, Moss Vale.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	L. S. Pieremont, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Quaker's Hill	C. Gardner, Blacktown.
Rawsonville	G. R. J. Hovenden. Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, W. Wyalong.
Spencer	H. J. Woodbury, Spencer.
Springside (via Orange)	E. H. Selwood, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Stratford	P. H. Deards, "Loch Maree," Stratford.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	W. Snushall, Tallong.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Tennyson (North Richmond).	H. C. Croft, Kurrajong.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Tingha	M. L. Levitt, Tingha.
Toronto	J. Froome, Knowle Farm, Toronto.
Ulan	P.S.D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wellington	L. Jurd, Warne-st., Wellington.
Wetherill Park	A. J. Hedges, Wetherill Park.
Windsor	W. H. Spinks, Windsor.
Wollun	J. B. Anderson. Wollun.
Wolseley Park	J. G. Downie, Wolseley Park.
Woonona	H. Coltman, Woonona
Wyan	———
Wyong	Edgar J. Johns, Wyong.
Yarramalong	E. Hodges, Yarramalong.
Yetholme	———
Yurrunga and Avoca.	F. Saville, Yurrunga.

Orchard Notes.

DECEMBER.

W. J. ALLEN.

Cultivation.

THOSE who ploughed early and have cultivated regularly and deeply, will receive the full benefit this season, and will find that, in spite of the long continued dry weather, sufficient moisture has been conserved in the subsoil to mature good quality fruit. The cultivator should be kept going, and the land stirred deeply and frequently.

Irrigation.

Growers who can command water for irrigation purpose, are in a fortunate position at this time. All trees and vines should receive a thorough watering this month, and again in January, care being exercised to avoid watering trees which are carrying ripening fruit. This is not advisable because it would fill the fruit up with water and spoil its keeping quality. Water should be applied just before the ripening period if possible.

Diseases of Fruit Trees

Black Spot of Apple and Pear.—Owing to the dry season Black Spot is little in evidence this season, but the weather conditions may change and produce the moist muggy conditions suitable for its development, therefore it is advisable, in those districts subject to attack, to use weak Bordeaux mixture with the arsenate of lead applications for Codlin Moth.

Mildew.—Although the season has been unusually dry, mildew is much in evidence in many districts, showing that wet weather is not necessary for its development. Iron sulphide should be used as a control.

Codlin Moth.—The third application of arsenate of lead should be made during this month, and a fourth application in January. In districts subject to cold weather in the early spring, an application will be necessary as late as February. In such districts it is believed that the first brood is somewhat late in coming, and that the late brood being unusually late does much damage. All affected fruit should be regularly collected and destroyed.

Pear and Cherry Slug.—Wherever this pest makes its appearance the trees should be immediately sprayed with arsenate of lead. It is essential that all growers should promptly exterminate this pest—like many other orchard pests it has a flying stage, and soon infests neighbouring orchards. It does great damage if not checked.

Diseases of Grape Vines.

Vine Moth.—Whenever the larvæ of this moth attack the vines they should be immediately sprayed with arsenate of lead.

Black Spot.—This season has not been favourable to the development of anthracnose, but where the vines were affected last season, a spraying of summer strength Bordeaux is advised, after the fruit sets, as a safeguard.

Mildew.—Oidium is in evidence on the vines in many localities, and dusting with sulphur should be practised regularly until the grapes begin to mature.

Downy Mildew.—A close watch should be kept for this, as it is very contagious, and will spread rapidly through a district. If any doubt exists, specimens should be immediately forwarded to the Department of Agriculture for examination by the Biologist. An immediate application of summer strength Bordeaux should be made to the vines.

The first indication of Downy Mildew is upon the young or green portions of the growing vine—it is largely confined to the leaves. The first indication of the disease consists of irregular spots on the upper side of the leaf, yellowish in colour, the spores rapidly and almost simultaneously develop on the under side of the leaf; later in the season the spots turn brown, and dark depressed areas may be produced on the stems.

Summer Pruning and Thinning.

Young trees require every attention, both in keeping the soil loose round them and in thinning out useless growths, and checking extra strong leaders which are running away from their fellows.

Summer pruning of young trees may be done this month, more especially those it is necessary to head back, such as plum and apricots. By heading back now the new top growth has time to mature thoroughly and ripen before the winter. All suckers from the stock should be removed.

Budding.

The new growth will now have sufficiently ripened to permit buds to be taken to rework other varieties of young stock. Buds inserted now may be started in a few weeks, and the tree formed or re-formed this season. Later buds are not started into growth until the spring.

Drying.

Suitable drying varieties of apricots will be sufficiently forward towards the end of this month for processing, and as the frosts destroyed the crop in many districts, little drying will be done, because a strong market should be offering for fresh fruit and for canning purposes.

Marketing.

Every attention should be given to the packing and marketing of fruit. Pack and grade carefully. There are difficulties ahead of the industry, and districts should organise strongly to meet these difficulties.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1919.

Society.	Secretary.	Date.
Miranda A. and I. Exhibition	L. J. Ennis	Jan. 10, 11
Albion Park A., H., and I. Association	H. G. Fraser	,, 15, 16
Gosford and Brisbane Water A. and H. Association	W. Moore	,, 24, 25
Kiama Agricultural Society	G. A. Somerville	,, 25, 27
Dapto A. and H. Society	F. James	,, 31; Feb. 1
Berry A. Association	W. Pryor	Feb. 5 6
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 13, 14
Central Cumberland A. and H. Assocn. (Castle Hill)	H. A. Best	,, 14, 15
Manning River A. and H Association	L. Plummer	,, 19, 20
Ulladulla A. and H Association (Milton)	R. F. Cork	,, 19, 20
Coff's Harbour and District A. Society	C. Vost	,, 20, 21
Wollongong A., H., and I. Association	W. J. Cochrane	,, 20, 21, 22
Yanco Irrigation Area A. Society (Leeton)	T. H. Hogan	,, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 25, 26, 27
Inverell P. and A. Association	J. T. Dale	,, 25, 26, 27
Dorrigo and Guy Fawkes A. Association	R. R. Blair	,, 26, 27
Gunning P., A., and I. Society	J. R. Turner	,, 26, 27
Newcastle A., H., and I. Association	E. J. Dann	,, 26, 27, 28; March 1
Bathurst A., H., and P. Association	S. V. Turrell	Mar. 4, 5, 6
Tenterfield P., A., and M. Society	R. S. Smith	,, 4, 5 6
Bega A., P., and H. Society	H. J. B. Grime	,, 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Tumut A. and P. Association	T. E. Wilkinson	,, 5, 6
Berrima District A., H., and I. Society (Moss Vale)	J. W. Kenny	,, 6, 7, 8
Bangalow A. and I. Society	W. H. Reading	,, 11, 12
Cootamundra A., P., H., and I. Association	N. Gardner	,, 11, 12
P. and A. Assn. of Central New England (Glen Innes)	G A. Priest	,, 11, 12, 13
Kangaroo Valley A. and H. Association	L. W. Vance	,, 12, 13
Nambucca A. and H. Association	M. Wallace	,, 12, 13
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 12, 13
Orange A. and P. Association	W. J. I Nancarrow	,, 12, 13, 14
Blacktown Branch of the Agricultural Bureau of New South Wales.	R. H. Lalor	,, 13, 14, 15
Goulburn A., P., and H. Society	H. C. Fraser	,, 13, 14, 15
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 18, 19, 20
Armidale and New England P., A., and H. Assocn.	A. McArthur	,, 18, 19, 20, 21
Cobargo A., P., and H. Society	T. F. Kennelly	,, 19 20
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